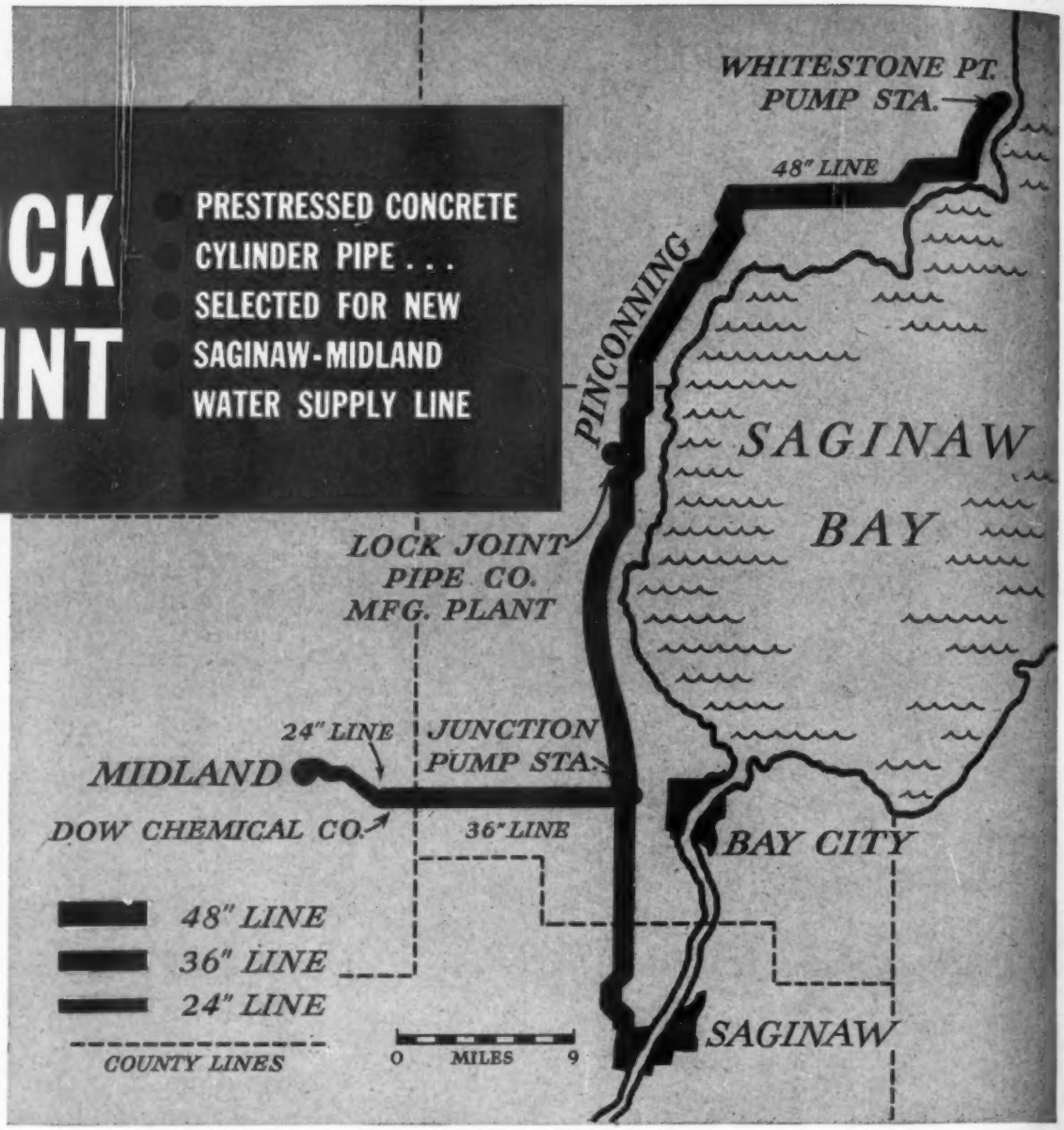
WATER & SEWAGE WORKS

A TOUGH SPOT ON NEW LOS ANGELES COUNTY SEWER

LOCK JOINT

PRESTRESSED CONCRETE CYLINDER PIPE . . . SELECTED FOR NEW SAGINAW-MIDLAND WATER SUPPLY LINE



ONCE AGAIN, Lock Joint Prestressed Concrete Cylinder Pipe has been selected for a major water works project.

SPECIFICATIONS issued by the Saginaw-Midland Water Supply Commission call for the manufacture and installation of 254,500 feet of 48 inch pipe . . . 143,230 feet of 36 inch pipe . . . 14,900 feet of 24 inch pipe . . . all operating at a pressure of 130 pounds.

WHEN COMPLETED, this 78 mile water supply line will be capable of delivering 23 MGD to the city of Saginaw and 20 MGD to Midland.

BY SELECTING Lock Joint Prestressed Concrete Cylinder Pipe, the Saginaw-Midland Water Supply Commission assures itself of a pipe line of maximum elasticity, permanent high carrying capacity and an estimated life of one hundred years or more.

LOCK JOINT PIPE COMPANY

Established 1905

P. O. BOX 269, EAST ORANGE, NEW JERSEY

Denver, Colo. • Chicago, Ill. • Kenilworth, N. J. • Kansas City, Mo. • Rock Island, Ill. Joplin, Mo. • Valley Park, Mo. • Cleveland, Ohio • Hartford, Conn. • Navarre, Ohio

SCOPE OF SERVICES Lock Joint Pipe Company specializes in the manufacture and installation of Reinforced Concrete Pressure Pipe for Water Supply and Distribution Mains in a wide range of diameters as well as Concrete Pipe of all types for Sanitary Sewers, Storm Drains, Culverts and Subaqueous lines.

WATER AND SEWAGE WORKS. Reg. U. S. Patent Off. May, 1948. Volume 95. Number 5. Published monthly by Gillette Publishing Co. at 404 North Wesley Ave., Mount Morris, Illinois. Per copy, 25c. Subscription rate: United States, $2.00 per year; Canada, $2.00 per year; Foreign, $3.00 per year. Entered as second-class matter March 4, 1946, at the post office at Mount Morris, Illinois, under the Act of March 3, 1879. Executive and Business offices, 22 W. Maple St., Chicago 10, Illinois. Editorial office, 155 E. 44th St., New York 17, N. Y.

Precision Engineered for Long, Hard Service

15 Years of Service . . . Over 1700 Installations

THE COMMINUTOR

Is Specifically Designed to Screen and Cut Sewage Solids Under Water

From the Mediterranean to the Philippines; from the Arctic Circle to Australia, wherever there is modern sewage treatment, you will find Comminutors. Such world-wide acceptance is based on a machine that efficiently and effectively performs a service unmatched by any other type of equipment.

The Comminutor, compact, economical, silent, does away with the need for screens, rakes, grinders, burial pits and incinerators or other means of destroying the filth that is obtained by the old methods. With no screenings to stand in the open, there is no odor, no additional labor, and none of the unsightliness usually connected with screenings and their disposal.

The sturdy construction of the Comminutor is the result of long experience. The drum is a single casting, precision machined to close tolerances. Cutting bars, combs and teeth are firmly seated, yet easily removable for sharpening or replacement. They are staggered and distributed to effect multiple small shearing actions. This, plus inertia of the drum in motion, and gearing, allows use of small motors with consequent power economy. No housing is required for the Comminutor.

The Chicago Pump Company Comminutor is the result of many years of research and trial. "Bugs" in early models have long been eliminated so that the machines in use for many years have established an incomparable record of successful performance in the field.

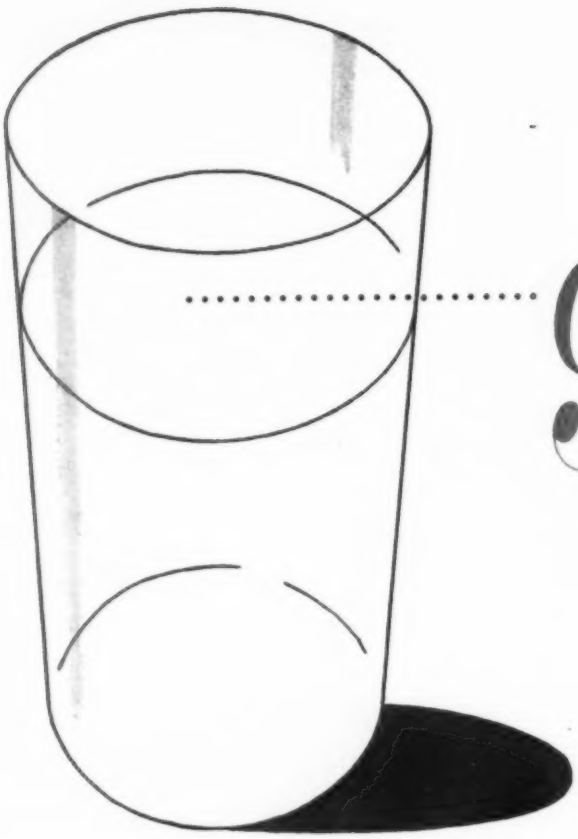
If you have work in the sewage treatment field, write today for the Comminutor Bulletin which gives complete engineering data.

CHICAGO PUMP COMPANY

SEWAGE EQUIPMENT DIVISION

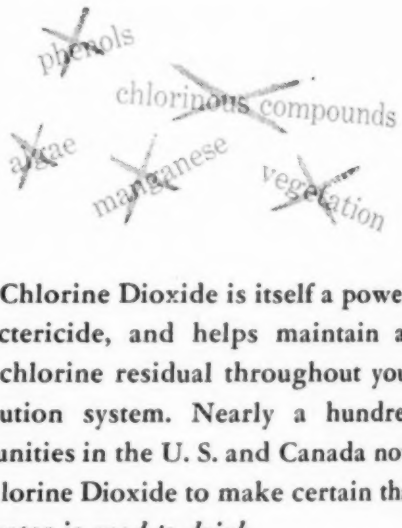
• COMMINUTORS • SWING DIFFUSERS •
• FLUSH-KLEENS • 'PAKAGE' PLANTS •
SCRU-PELLERS • SAMPLERS • NON-CLOG PUMPS

2349 WOLFRAM ST. CHICAGO 18, ILLINOIS



good water

HAS NEITHER TASTE
...NOR ODOR



Complicated or expensive treatment isn't necessary when using Mathieson Chlorine Dioxide. You can eliminate most tastes and odors completely . . . greatly improve the rest with this powerful oxidizing agent.

Chlorine Dioxide is readily generated from Sodium Chlorite at point of use. It destroys tastes and odors due to algae and other organic matter . . . oxidizes objectionable compounds formed during chlorination . . . changes manganous salts to insoluble manganic compounds. What's more, Chlorine Dioxide is itself a powerful bactericide, and helps maintain an active chlorine residual throughout your distribution system. Nearly a hundred communities in the U. S. and Canada now use Chlorine Dioxide to make certain that their water is *good to drink.*

Write for details of the widely flexible Mathieson Chlorine Dioxide treatment for the elimination of tastes and odors. Mathieson Chemical Corporation, 60 East 42nd Street, New York 17, N. Y., *formerly The Mathieson Alkali Works (Inc.).*

make yours good water with

Mathieson
CHLORINE DIOXIDE

Chlorine Dioxide...Sanitation HTH...Liquid Chlorine...PH-Plus (Fused Alkali)...Caustic Soda...Soda Ash...Bicarbonate of Soda...Ammonia, Anhydrous & Aqua...Carbonic Gas Dry Ice...Sodium Chlorite Products...Sodium Methylate

WATER & SEWAGE WORKS

WATER SUPPLY—SEWAGE DISPOSAL—INDUSTRIAL WASTE TREATMENT

E. S. GILLETTE, Publisher

L. H. ENSLOW, Editor

COMING!

Professional Standing of the Water Works Manager—An All-Important Consideration

The title of this article is self-explanatory. The author is especially well qualified to discuss this important topic, since he long managed a privately operated water utility before assuming the management of a publicly owned water supply system. One of our favorite "go-getters" amongst water-works managers, he is—

LESLIE A. JACKSON, Manager-Engineer,
Little Rock (Ark.) Municipal Water Works.

Disposal of Liquid Digested Sludge

Has proved to be profitable to both the Indiana farmers who use it as fertilizer, and the Marion (Ind.) Sewage Treatment Works which sells it. This method of disposal compares favorably in cost with chemical treatment and filtering. This complete and interesting story of the marketing of "Liquid Farm Fertilizer" is told by one of Marion's leading citizens—

DAVID BACKMEYER, Supt.
Water & Sewage Works, Marion, Ind.

Handling Chlorine Safely

Is an article which describes and pictures methods and procedures of handling, transporting and stering liquid chlorine safely. It also calls attention to some specific "don'ts" in handling chlorine if the maximum safety is to result. The experiences of many have been drawn on for this article by—

JOHN O. LOGAN, Chemical Engineer,
The Mathieson Chemical Corp, N. Y. City.

"White-Water" Treatment and Recovery

Is a report of the results from studies to determine the proper coagulants and the most effective and economical methods of coagulation, clarification and possible money saving re-use of the so-called "white-waters" ordinarily wasted to streams by the pulp and paper products industry, which practice actually represents dollars down the sewer. This contribution comes from—

DR. W. RUDOLFS and EARL J. AXE,
Dept. of Water & Sewage, Rutgers Univ., N. J.

Trickling Filters for Treating Pulp and Papermill Wastes—

Are highly recommended for that purpose in a three-part article dealing with the complex subject of the treatment of pulp and paper mill wastes. This comprehensive study of the application of trickling filters to this problem has been prepared by

HARRY W. GEHM, Tech. Advisor,
Nat. Council for Stream Improvement

Operation of Small Filtration Plants

Is the subject of a current series of short articles dealing with the operation and maintenance of small filtration plants by an author who has had considerable experience—

A. E. CLARK, Gen'l Mgr.,
Nashville (Tenn.) Suburban Util. Distr.

Geologic Correlation and Hydrologic Interpretation of Water Analyses

Is the rather imposing title of an article on the highly important problem of ground-water recession and experimental recharge of aquifers. This particular study was made at Peoria, Ill., and is reported by—

T. E. LARSON, Chem. Div. Head,
State Water Survey, Urbana, Ill.

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MODERN WATER FILTRATION SYSTEM → INCREASES EFFICIENCY → LOWERS COSTS

Installing an ALOXITE aluminum oxide porous plate underdrain system in rapid sand filters is the modern solution to expensive problems of water filtration.

Its simple construction and operating principles assure efficiency and economy. The use of graded gravel is eliminated. There is no problem of mud ball formations, upsetting or loss of filter media. Backwash is complete, uniform and positive. Maintenance is easier. Corrosion resistant ceramic plates are easily cleaned and stay clean longer. Initial head loss through the system remains lower. Reduced filter height cuts down filtering and backwashing operating heads.

Add to these advantages, the elimination of costly and tedious jobs of regrading sand and gravel. Consider the fact that no metal parts subject to corrosion are required. Then it is easy to understand why the installation of ALOXITE underdrain systems has gained popularity.

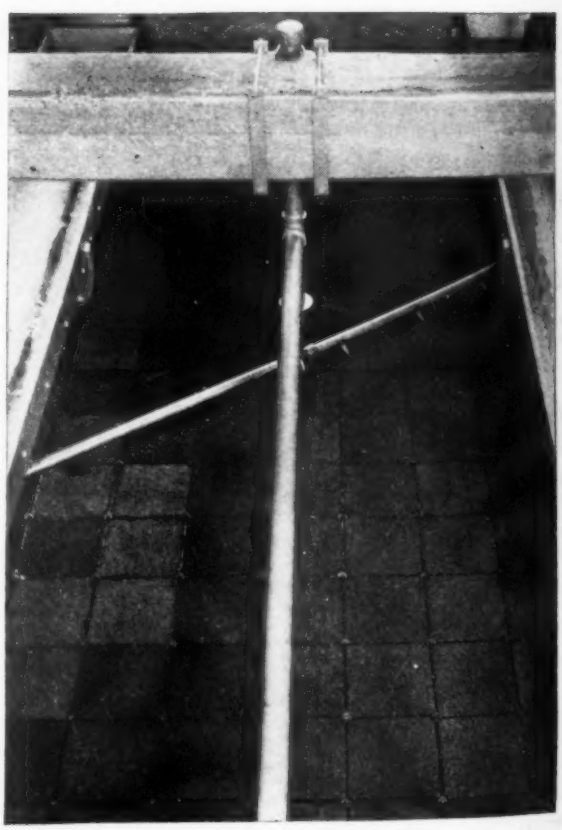
More City Filtration Plants Turning To ALOXITE Underdrain System

Consistent troubles with filters has led many cities to investigate the ALOXITE Underdrain System. Here is the typical experience of one.

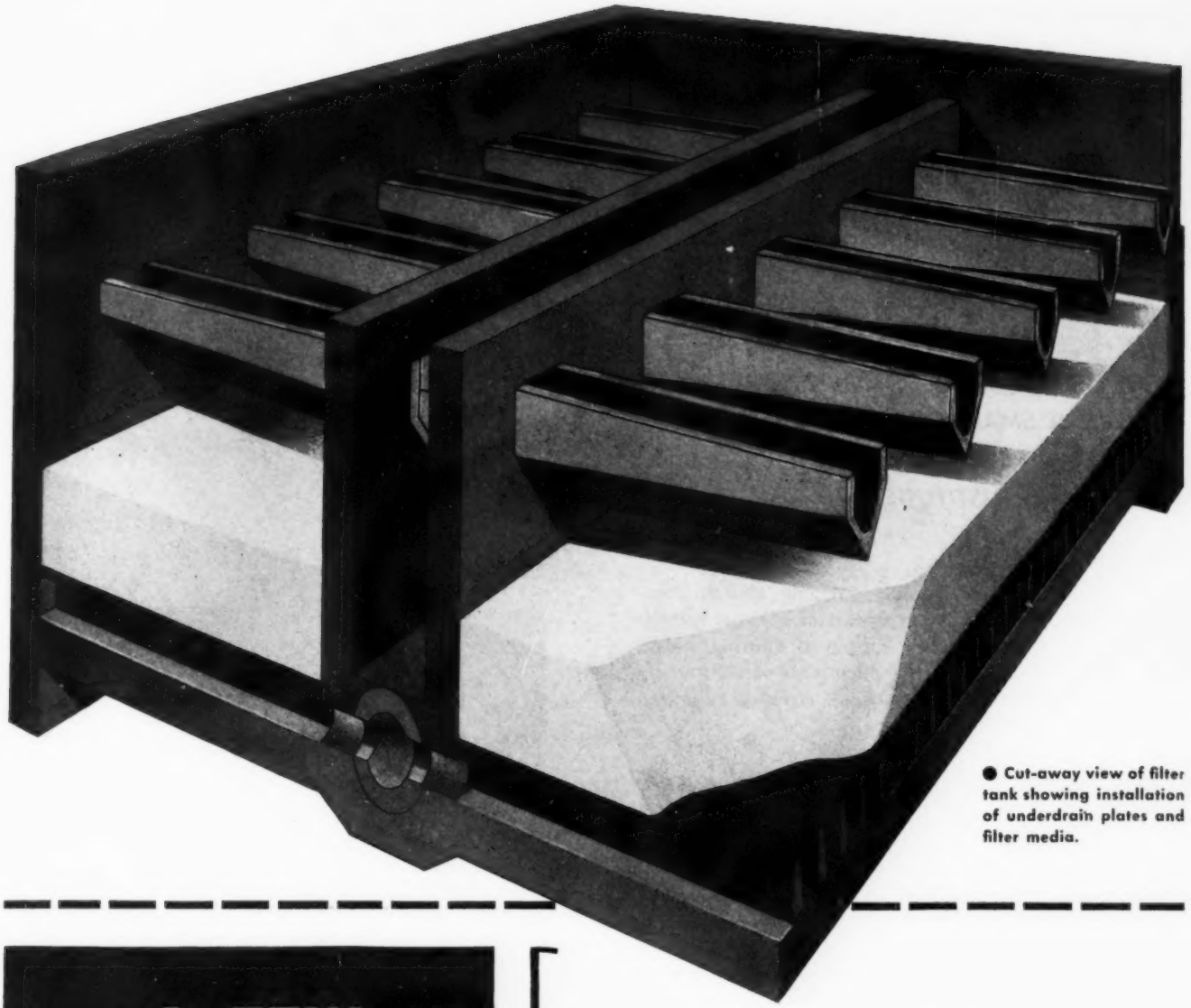
"Before modernizing the two filters in this plant, each with a capacity of ½ MGD, service was unsatisfactory...maintenance expenses high. Complete shutdowns for regrading and screening sand and gravel were required regularly. This was complicated by mud ball formations.

"Switching to ALOXITE plates, all these and more troubles are entirely eliminated. Less backwashing water is used and many other important savings are recorded."

This experience is confirmed by an expanding list of users who followed the suggestion to modernize with ALOXITE underdrain plates. If you are planning new construction or a modernizing job—talk it over with our technical staff. Get the facts before you act. Write Department **M-58**. The Carborundum Company, Refractories Division, Perth Amboy, New Jersey.



Typical installation in municipal water filtration plant.



● Cut-away view of filter tank showing installation of underdrain plates and filter media.

A FEW ADVANTAGES of this Modern Underdrain System

1. No mud ball formations
2. Graded gravel eliminated
3. Low head loss
4. Less wash water
5. Uniform backwashing
6. Low maintenance
7. No clogging or corrosion
8. Longer filter runs
9. Easy to operate
10. Easy to install

Underdrain Plates

BY CARBORUNDUM

TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

HERE'S A "PACKAGE" TREATMENT PLANT *that fits a modest budget*

MODERATE FIRST COST, HIGH DEGREE OF PURIFICATION AND EXCEPTIONALLY LOW OPERATING COST MAKE THIS DEPENDABLE UNIT IDEAL FOR SMALL COMMUNITIES UP TO 3500 PERSONS AND FOR ISOLATED PLANTS AND INSTITUTIONS

Many small communities and outlying plants, compelled on the one hand to purify wastes in order to stop pollution, but lacking ample supply of diluting water, have solved their seemingly insoluble difficulty by means of the Yeomans "Package" Aerifier activated sludge plant.

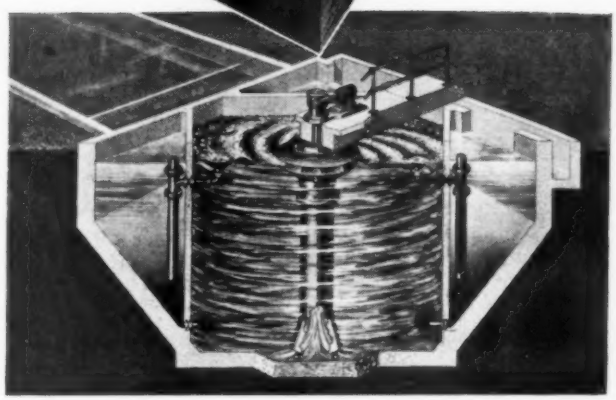
HIGH EFFICIENCY AT LOW COST

Here indeed is a highly efficient means of purification designed to fit the modest budget. In a single compact concrete unit of minimum dimensions you get aeration and final sedimentation; producing crystal-clear effluent at remarkably low over-all plant cost. Because there are no odors or flies, the plant can be located near habitation. Operation is simple, with supervision limited to routine check-up. All units are open for visual inspection. With its permanent concrete construction it is a plant that will perform efficiently for many years.

GOOD ENGINEERING

Each installation of the Yeomans Aerifier includes final adjustment, initial tested operation, thorough training of operators and continued counsel from an organization with a 50-year reputation for good engineering.

A Yeomans recommendation, based on data covering your needs, complete with construction cost estimates and application engineering, will be sent upon request.



Basic element of the "Aerifier" is the Yeomans "Spiralflo" mechanical aerator. Its essential parts are

- *a stationary up-draft tube*
- *a rotating aeration cone*
- *an electrical and mechanical drive unit to rotate the cone*

By rotation of the cone, liquor is drawn up through the tube and thrown out in spiral waves—entraining air bubbles to permeate the entire content of the tank with oxygen. The tank content rotates gently, to preserve the floc and promote flocculation. Aeration is complete. There is no deposit of activated sludge on the tank bottom. Power consumption is low.

Other "Aerifier" parts are adjustable loading funnels, angular corner clarifier compartments, automatic return for activated sludge to the aeration tank, and automatic return of excess activated sludge to the primary tank.

These bulletins will be found most helpful—write for them:

"SPIRALFLO" AERATOR—a full description of this simple, highly efficient unit. Bulletin 6601

"AERIFIER" — for activated sludge plants—a complete explanation of design, construction and operation principle. Bulletin 6651

YEOMANS BROTHERS COMPANY, 1423 NORTH DAYTON STREET :: CHICAGO 22, ILLINOIS

FOR HANDLING AND TREATMENT OF DOMESTIC SEWAGE AND INDUSTRIAL WASTE, YEOMANS MANUFACTURES

Yeomans Aero-Filter—high capacity trickling filter process • Yeomans "Package" Aerifier—activated sludge process • Rectangular and Circular Sludge Collectors • Digesters • Centrifugal and Pneumatic Sewage Ejectors • Scum, Grease and Sludge Pneumatic Ejectors • Rotary Distributors • Plunger Sludge Pumps

1898 **YEOMANS** 1948

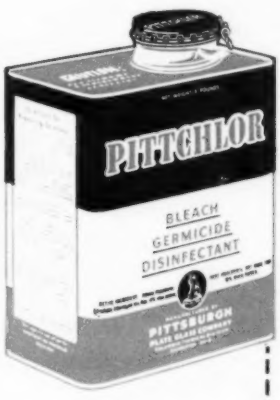
50 YEARS OF PUMP EXPERIENCE

WHEN THAT DISTRIBUTOR STARTS HANDLING

PITTCHLOR

That's right, Orgie. The honeymoon will be over the day a Pittchlor distributor goes to work in your area. And the news will be just as depressing to colonies of your bacteria neighbors. Because Pittchlor is lethal to chlorine-susceptible bacteria and algae. Pittchlor is excellent for the chlorination of water supplies, the treatment of sewage, and for many other disinfection, deodorization and general sanitation purposes.

A high-test, stable calcium hypochlorite—containing 70% available chlorine—Pittchlor is easy to use either manually or through relatively simple mechanical feeders.



Packed in 5 lb. resealable cans (9 per case), 3¾ lb. cans (12 per case) and 100 lb. drums.

Look into the distribution opportunities still available in some areas

Use this coupon to obtain complete information

Pittsburgh Plate Glass Company
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Fifth at Bellefield, Pittsburgh 13, Pa.
Gentlemen:
Send me information on
☐ How I can become a Pittchlor distributor
☐ How to use Pittchlor for_____
(use intended)

NAME_____
COMPANY_____
ADDRESS_____

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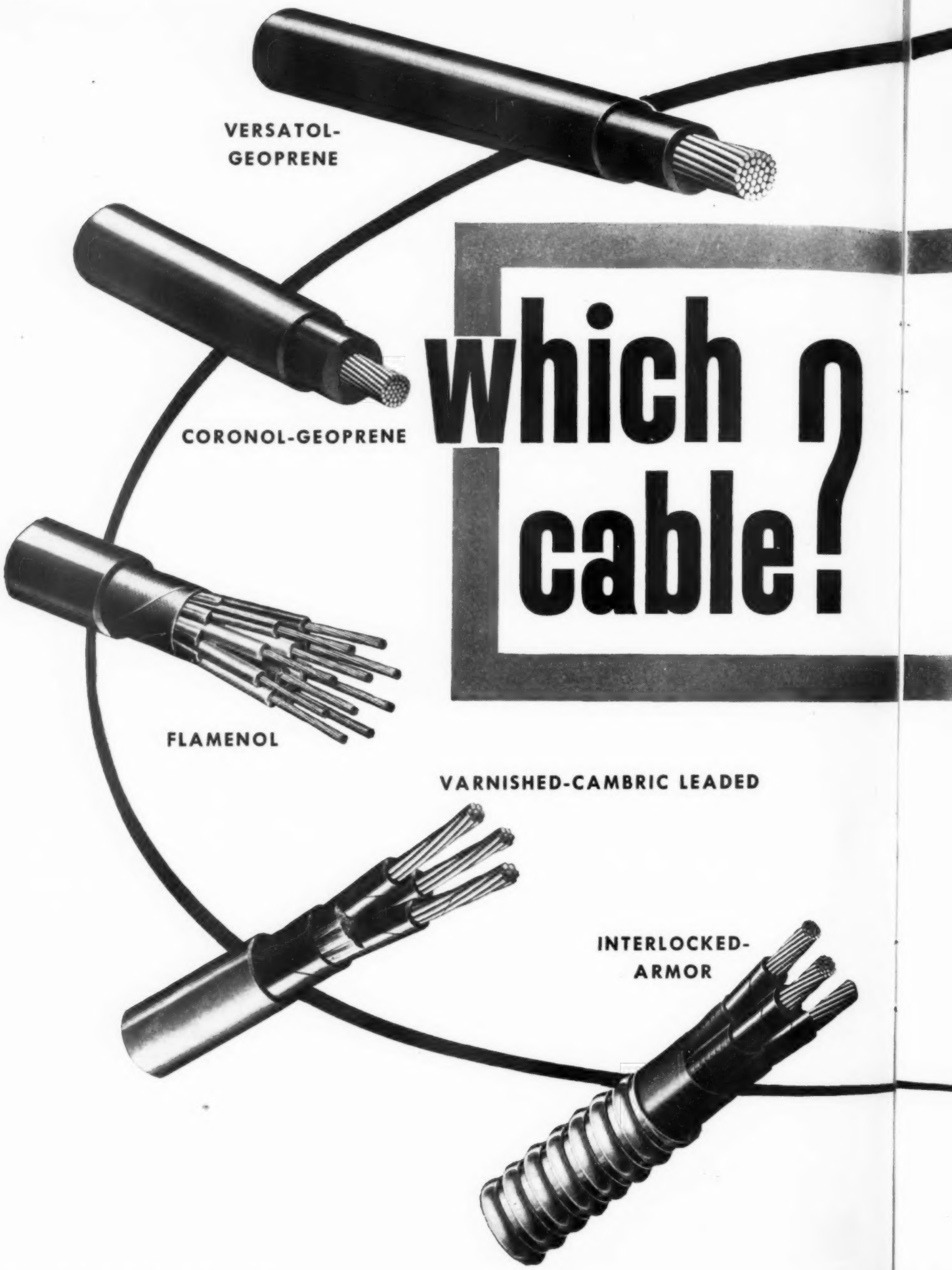

VERSATOL-
GEOPRENE
CORONOL-GEOPRENE
FLAMENOL
VARNISHED-CAMBRIC LEADED
INTERLOCKED-
ARMOR

which cable?

check this table

Maximum Voltage	How Installed	Installation Condition	Recommended Cable Type
	POWER CIRCUITS		
600	Exposed	Dry	Interlocked-Armor
	Conduit or Duct	Wet or Dry	Versatol-Geoprene
	Direct Burial	Wet	Versatol-Geoprene
5000	Exposed	Dry	Interlocked-Armor
	Direct Burial	Wet	Coronol-Geoprene
	Conduit or Duct (without manholes)	Wet or Dry	Coronol-Geoprene
	Duct (with manholes)	Wet	Varnished-Cambric Leaded*
15000	Conduit or Duct	Wet or Dry	Varnished-Cambric Leaded*
	CONTROL CIRCUITS		
600	No restrictions		Flamenol
	YARD LIGHTING CIRCUITS		
600	Direct Burial	Wet	Versatol-Geoprene
5000	Direct Burial	Wet	Flamenol Series-Lighting

* A Geoprene jacket over the lead should be specified where there may be exposure to organic acids or alkalies.

CAREFUL CABLE SELECTION: KEY TO SYSTEM RELIABILITY

Poor cable or poor cable selection can make even the best electric equipment ineffective. High power loss, early deterioration, costly cable faults and damage to connected equipment can easily plague the sewage or waterworks plant where cable was "just thrown in."

But your G-E cable specialist can help you and your consultants avoid these troubles in your new plant. His responsibility is to select the right cable for each type of service . . . and he has the "job-fitted" cable to do it. Thousands of successful installations stand behind his choice.

But cable is only one element of a co-ordinated electrical system for water and sewage plants. If you elect to purchase *all* the electric equipment for your new plant from General Electric, including Cabinetrol, motors and unit substation, we will assume the added responsibility for the co-ordination and supervision during installation of all this electric equipment—thus simplifying your engineering, buying, installation and servicing because you're dealing with only one manufacturer. *Apparatus Dept., General Electric Co., Schenectady 5, N. Y.*

CO-ORDINATED

WATER-PLANT . . . SEWAGE-PLANT

ELECTRIFICATION

GENERAL ELECTRIC

668-51

what if your gate valves **fail?**

It is always possible that your gate valves will be called on to meet an emergency. Flood, pollution, catastrophic fire—will your gate valves *work*, and save the situation?

Because of what *could* happen, many communities insist on R. D. Wood Gate Valves. They base their preference on performance-records over the years. And the simplicity of the design inspires their confidence; for the internal mechanism contains only 3 moving parts—the spreader and discs. Free to turn on the trunnions, the discs distribute the wear rather than taking it in one place. They lift into the bonnet without drag. In closing, they are thrust from the center—from the hub—and are pushed on to their brass seats without distortion. No pockets to collect scale and sediment. When the valve is open there is an unobstructed passageway for water.

Give your community this extra measure of security. Specify the time-proved R. D. Wood Gate Valves.

R. D. WOOD COMPANY

Public Ledger Building, Independence Square, Philadelphia 5, Pa.

Manufacturers of Mathews Hydrants and "Sand-Spun" Pipe (Centrifugally Cast in Sand Molds)

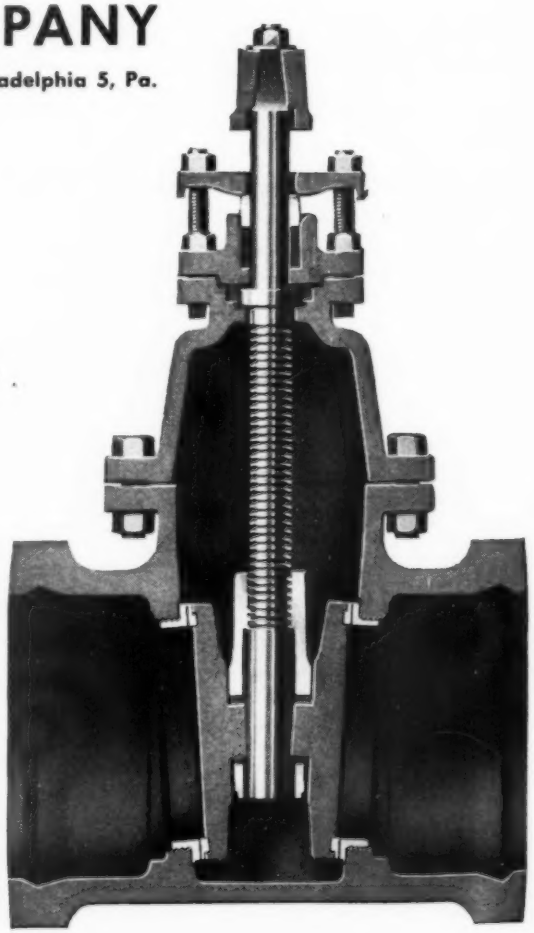
High-strength cast iron.

Fully bronze-mounted.

Rigidly inspected, tested to 300 lbs. hydrostatic pressure.

Conforming to A.W.W.A. specifications.

Sizes from 2" to 30".



CHLORINE

"Go Fishin'" in the River beside your plant?

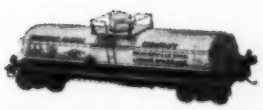
DIAMOND

Liquid

Chlorine

will help make it possible!

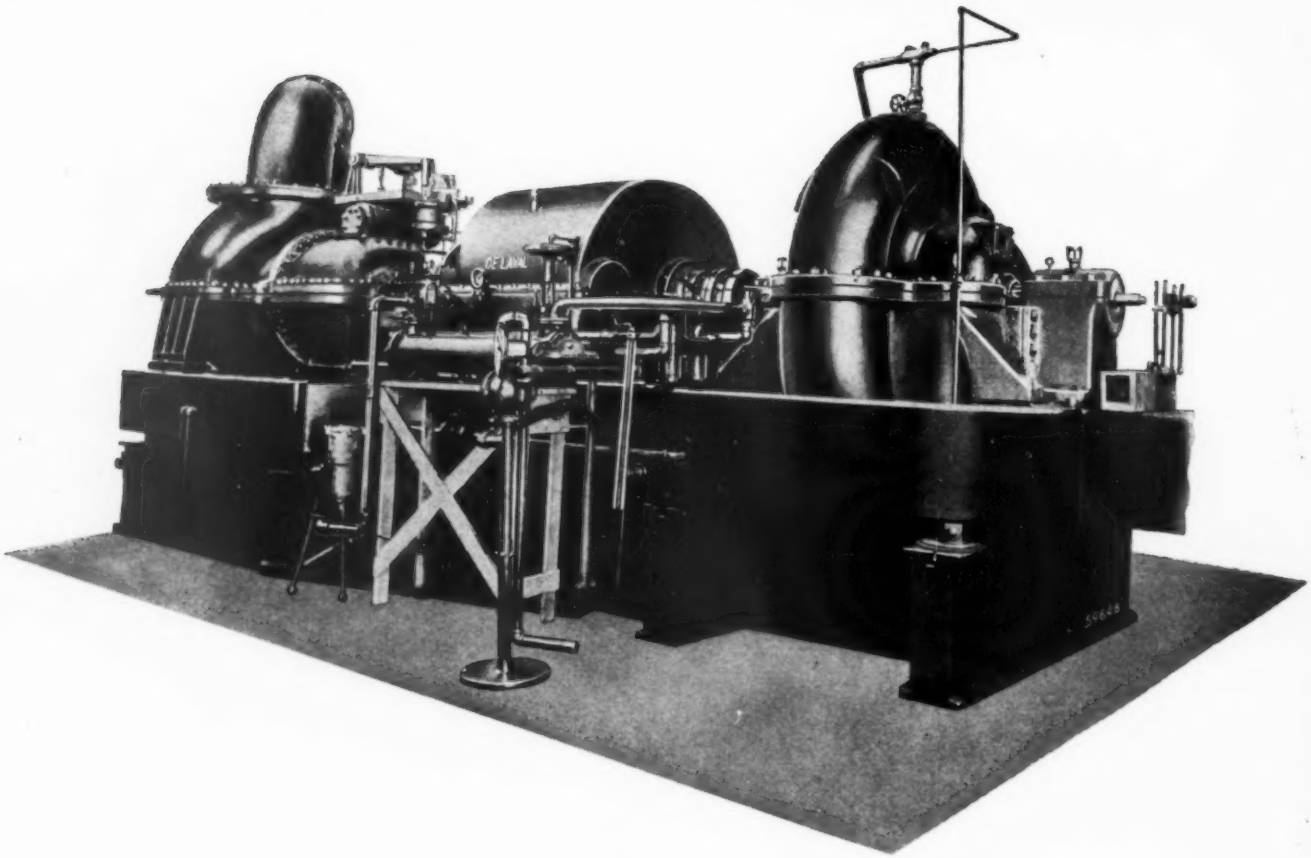
Fishing and other recreational activities along our rivers and streams are becoming more and more a reality as federal, state and local programs progress toward the elimination of stream pollution. Diamond Liquid Chlorine is playing an important role in the development of this program, through the chlorination of domestic sewage and industrial wastes by industrial plants and communities.



SHIPPED TO YOU IN TANK CARS

MULTI-UNIT CARS—

CYLINDERS, AS REQUIRED



On test for Chicago

DE LAVAL 75 mgd TURBINE-DRIVEN PUMP

Within the last twenty-seven years the City of Chicago has installed De Laval pumping units having a combined capacity of one billion, two hundred and forty-five million gallons daily. The latest of these is a De Laval 75 mgd pump driven by a De Laval turbine employed to provide maximum economy at varying rates of delivery.

DE LAVAL WW4

STEAM TURBINE CO., TRENTON 2, NEW JERSEY

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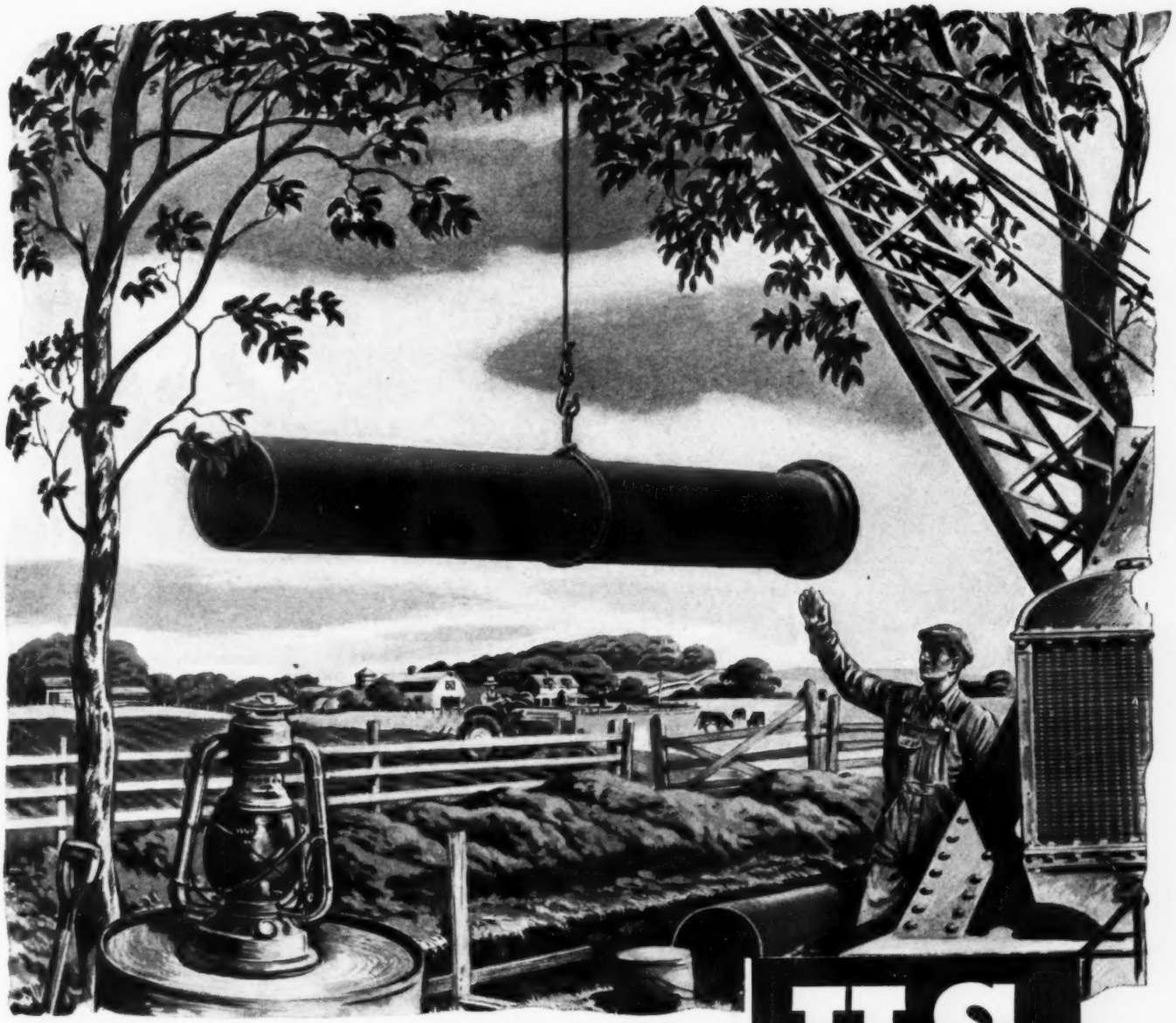
Winnipeg • Edmonton • Helena • Houston • Kansas City • Los Angeles • New Orleans • New York
Washington, D. C. • Philadelphia • Pittsburgh • Rochester • St. Paul • Salt Lake City • San Francisco • Seattle

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS • CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS AND COMPRESSORS • IMO OIL PUMPS



Painted for U. S. Pipe & Foundry Co. by Paul Laune

U.S. PIPE

THE rewards of research are evidenced by the progressive improvements in U. S. Cast Iron Pipe during the past quarter-century. First, the development of deLavaud centrifugally cast pipe—a stronger, lighter cast iron pipe costing the user less per foot. Then, the development of the Super-deLavaud process producing a centrifugally cast pipe with greatly improved physical properties. These major developments have been augmented by a number of manufacturing refinements which have resulted from a continuous, intensive research and development program. Such refinements have made it possible to improve and control more closely the quality of our products. **United States Pipe and Foundry Co., General Offices: Burlington, New Jersey. Plants and Sales Offices Throughout U.S.A.**

A two-way stretch every forty feet

Here's a pipe line that can flex and stretch at every joint without losing its figure. Even earth movement near the riverbank, and the freeze-and-thaw of northern winters will leave it bottle-tight.

Each forty-foot section of strong, shatter-proof steel pipe is cushioned against the stresses of underground service by the flexible Dresser Couplings which join it to its neighbors. The couplings, with their specially compounded rubber gaskets, harmlessly absorb expansion, contraction and other movement . . . assure continued joint tightness.

A Dresser-Coupled steel line makes for speedy installation, too. You use plain-end pipe in standard lengths. No need to waste time lining up ends exactly. Simply slip on the factory-made and tested couplings and tighten the bolts. Any workman who can use a wrench can do it. No guesswork, either. You get a permanently tight joint every time.

And with Dressers, you get the full advantage of modern, glass-smooth pipe linings. Dresser Couplings fit outside the pipe. There is no heat to damage lining—no need for workmen to go inside the pipe.

For top performance and an extra margin of safety, specify a Dresser-Coupled steel line. Detailed information on request.

PARTIAL LIST OF CITIES USING DRESSER-COUPLED STEEL LINES

Albuquerque, N. M.	Detroit, Mich.	New York, N. Y.
Boston, Mass.	Harrisburg, Pa.	Philadelphia, Pa.
Chicago, Ill.	Kansas City, Mo.	Saginaw, Mich.
Cleveland, Ohio	Milwaukee, Wisc.	Savannah, Ga.
Denver, Colo.	Newark, N. J.	Syracuse, N. Y.
	Washington, D. C.	

SIMPLE • FAST • FLEXIBLE • PERMANENT

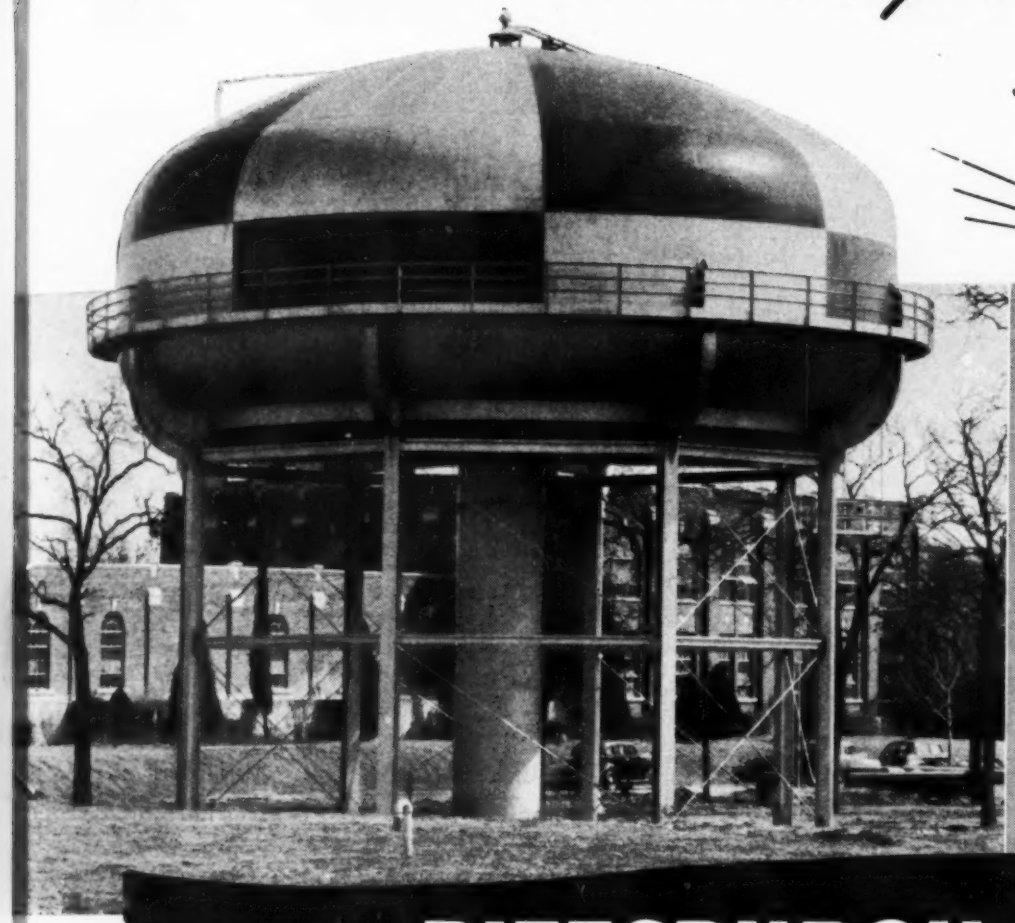
Even in cramped quarters encountered in city work, Dresser Style 38 Couplings make permanently tight, flexible joints every time.

DRESSER COUPLINGS

ONE OF THE DRESSER INDUSTRIES

Dresser Mfg. Division, 59 Fisher Ave., Bradford, Penna. • In Texas: 1121 Rothwell St., Houston • In Canada: 60 Front St., W., Toronto
Sales Offices: New York, Chicago, Houston, San Francisco

MEET *"Mr. Five-by-Five!"*



the largest wash-water tank in the country... at *Dallas, Tex.*

by PITTSBURGH • DES MOINES

Here is a "character" among our Elevated Steel Tanks. Mr. Five-by-Five stands 64 feet high, is precisely 64 feet wide, and holds a cool 500,000 gallons of wash-water in a 22-foot 4-inch range of head.

For Dallas, this unusual tank does an unusual job. It washes nine of the City's 32 filters without refilling, and the drop in pressure for one 55,000-gallon washing is barely one pound per square inch.

A rather special job—but typical of Pittsburgh-Des Moines' time-proved ability to solve special water storage problems. May we have your inquiry?

PITTSBURGH • DES MOINES STEEL COMPANY

Plants at PITTSBURGH, DES MOINES and SANTA CLARA

Sales Offices at:

PITTSBURGH.....3418 Neville Island
NEW YORK.....Room 918, 270 Broadway
CHICAGO....1222 First National Bank Building
DES MOINES.....919 Tuttle Street
DALLAS.....1223 Praetorian Building
SEATTLE.....526 First Avenue, South
SANTA CLARA, CAL.....625 Alviso Road

THE PIPE USERS ANSWER

Based on actual survival and retirement experience, what do we really know about the useful life of water works facilities? That was the $64 question water works men asked themselves. Here is how they came up with the answer.

A committee was formed by 3 water works organizations to direct a survey of the recorded experience of 25 cities, large and small, from Canada to Florida. These cities were selected as comprising a cross-section of various water service conditions. The facts were obtained by and from water works men. The survey has been completed and the findings published by the American Water Works Association.

In the 25 cities surveyed, 50 million feet of cast iron water mains, sizes 6-inch and over, had been laid in the 128 years since 1817. The survey revealed, as the chart opposite shows, that 96% of all cast iron water mains ever laid in these 25 cities, sizes 6-inch and over, *are still in service!* An official record that speaks for itself.

The cast iron pressure pipe industry, in spite of raw material shortages, achieved in 1947 one of the biggest production years in footage in the history of the industry, and has recently installed additional footage capacity.

Mr. Q. Check says:
Collect and sell your scrap *NOW*

All statements and percentages regarding service records of cast iron mains set forth in this advertisement are based on published reports of a survey directed by a Joint Committee representing the American Water Works Association, New England Water Works Association, and the Institute of Water Supply Utilities. The findings, as they apply to cast iron pipe, have been reprinted by permission in our brochure "Survival and Retirement Experience with Cast Iron Water Mains." If you have not received a copy, write to Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, 122 South Michigan Avenue, Chicago 3, Illinois.

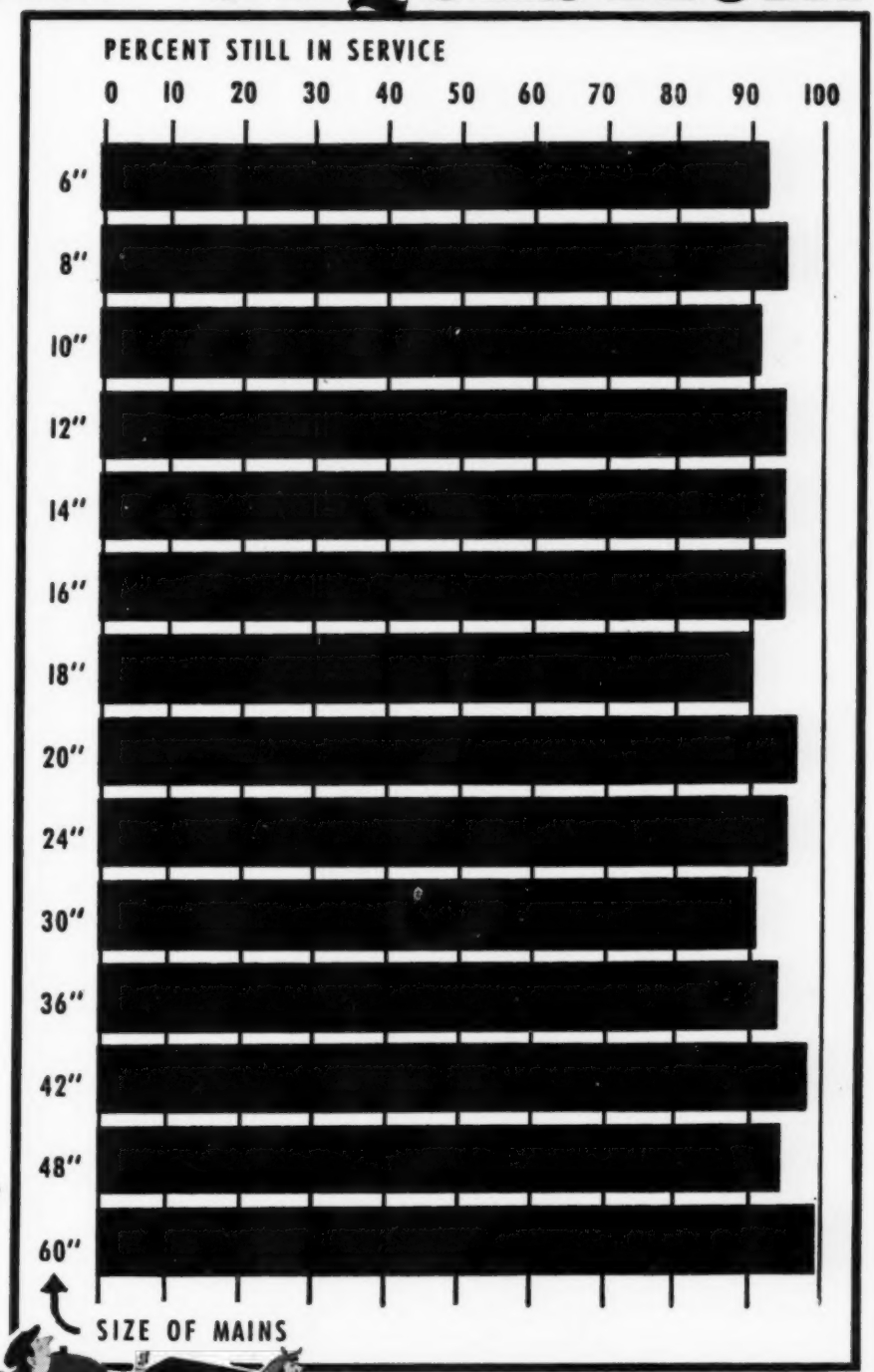
CAST IRON PIPE

THEIR OWN $64 QUESTION!

96% OF ALL CAST IRON WATER MAINS* LAID IN THESE 25 CITIES OVER A PERIOD OF 128 YEARS ARE STILL IN SERVICE

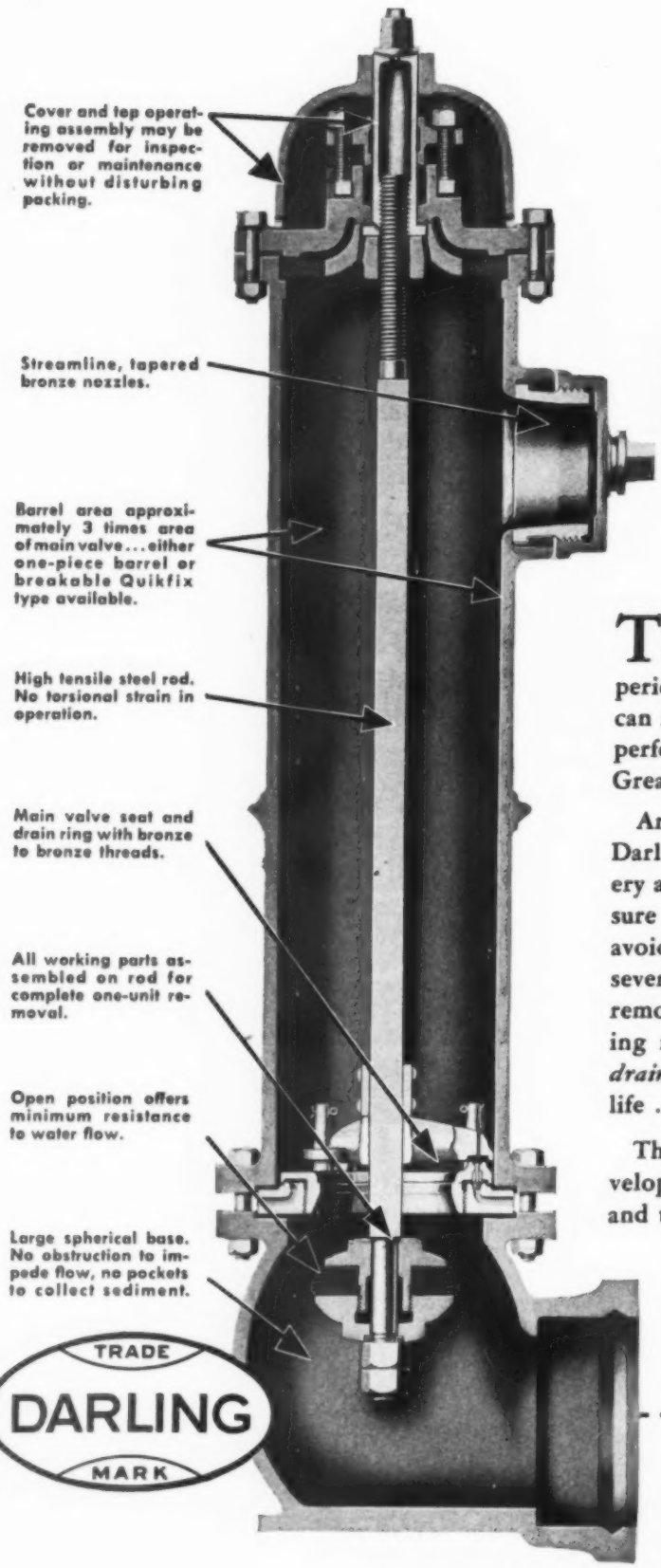
Alexandria, Virginia
Babylon, New York
Clinton, Iowa
Clyde, New York
Denver, Colorado
Des Moines, Iowa
Detroit, Michigan
Huntington, West Virginia
Jamaica, New York
Merrick, New York
Norwich, New York
Ottawa, Ontario
Philadelphia, Pennsylvania
Portland, Maine
Rochester (Suburban), N. Y.
St. Mary's, Pennsylvania
St. Paul, Minnesota
Sag Harbor, New York
Scranton, Pennsylvania
Springfield, Massachusetts
Summit, New Jersey
Syracuse (Suburban), N. Y.
Utica, New York
West Palm Beach, Florida
Winnipeg, Manitoba

*Sizes from 6 to 60 inches.



SERVES FOR CENTURIES

Peace of mind sums it up!


Cover and top operating assembly may be removed for inspection or maintenance without disturbing packing.
Streamline, tapered bronze nozzles.
Barrel area approximately 3 times area of main valve...either one-piece barrel or breakable Quikfix type available.
High tensile steel rod. No torsional strain in operation.
Main valve seat and drain ring with bronze to bronze threads.
All working parts assembled on rod for complete one-unit removal.
Open position offers minimum resistance to water flow.
Large spherical base. No obstruction to impede flow, no pockets to collect sediment.

THIS man shares responsibility in his town for fire-fighting efficiency and operating cost. Experience has shown him that on both counts he can rely on Darling hydrants for the finest kind of performance . . . year around, year in, year out! Greater peace of mind is another way of putting it.

Are you familiar with all the *advanced* features of Darling hydrants? These include peak water delivery at the nozzles with no perceptible loss of pressure . . . positive, automatic flushing of drains to avoid freeze-ups . . . prevention of flooding despite severe traffic damage . . . fast, simplified, *one-man* removal and inspection of *all* working parts including main valve, *main valve seat,* drain valve and *drain valve seats* . . . unsurpassed ruggedness and life . . . modern, good-looking exterior.

These are only a few of the Darling features developed to ease your mind on hydrant performance, and to ease your budget on over-all cost! Catalog 17M describes *all* the features in detail, tells all about Darling hydrants for every known service both normal and unusual. We'll be happy to send you a copy.

TRADE DARLING MARK

DARLING
VALVE & MANUFACTURING CO.
Williamsport 11, Pa.

PENNSALT
Liquid Chlorine

PENNSALT CHEMICALS

Perchloron*
Anhydrous Ammonia
Filter Alum
Ferric Chloride
Sodium Aluminate
Quaker Improved Chlorinated Lime*
Caustic Soda, and other products

'Way back in 1909, the first tank car load of Liquid Chlorine rolled out of Pennsalt's Michigan works.

Since then, Pennsalt's Liquid Chlorine has helped sanitize countless drinks of water . . . contributed to sludge stabilization, aided precipitation and prolonged disinfecting action.

In addition, Pennsalt Chlorine is widely used for the control of odors in sewage and in prevention of manhole and sewer disintegration. Pennsylvania Salt Manufacturing Co., Phila. 7, Pa.

PENN SALT

*REG. U. S. PAT. OFF.

In this unusual new Sewage Disposal Plant

5 services are

Byers Wrought Iron

One of the finest and most unusual sewage treatment plants in the country has recently been completed at the University of Florida, Gainesville, Florida. One of its primary purposes is to permit experiments to determine the most efficient and economical type of sewage disposal, and operations are being watched with great interest by sanitary engineers.

Reynolds, Smith and Hill were the consulting engineers, and C. D. Williams, Head Professor of Civil Engineering, the resident engineer. Paul Smith Construction Company was the general contractor.

COMBATING CORROSION

Widespread use of Byers Wrought Iron pipe is standard practice in modern sewage plants and this one is no exception. The plant has two trickling filters—one standard rate, the other high rate—and in each the rotary distributors are genuine wrought iron pipe. The same material was used for the 2″ sampling lines from raw sewage influent, primary and secondary sedimentation, trickling filters, and final effluent. The 3″ gas lines from two digestor tanks to sludge heat exchanger and from sludge heat exchanger to lab, and all supernatent lines, are also Byers Wrought Iron pipe. The sampling lines run underground, so that the corrosion-protection of wrought iron is doubly important.

PROVEN PROTECTION

The almost universal use of wrought iron in present-day plants is the best certification of its excellent performance. Engineers have applied the material in practically every service in the treating plant, and have found that it stands up in applications where ordinary materials failed in a matter of months.

The reason for wrought iron's superior service is found in its unique composition and structure. Tiny fibers of glass-like silicate slag, threaded through the body of high-purity iron, halt and "detour" corrosive attack, and so discourage pitting. The fibers also anchor the initial protective scale, which shields the underlying metal.

WANT THE FACTS?

Our technical bulletin, "Wrought Iron for Sewage Treatment and Disposal Installations", reviews the conditions encountered in various services, and reports the results obtained with wrought iron. Would you like a copy? Just write.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, Salt Lake City, Seattle, San Francisco. Export Division: New York, N. Y.

CORROSION COSTS YOU MORE THAN WROUGHT IRON

BYERS

GENUINE WROUGHT IRON

TUBULAR AND HOT ROLLED PRODUCTS

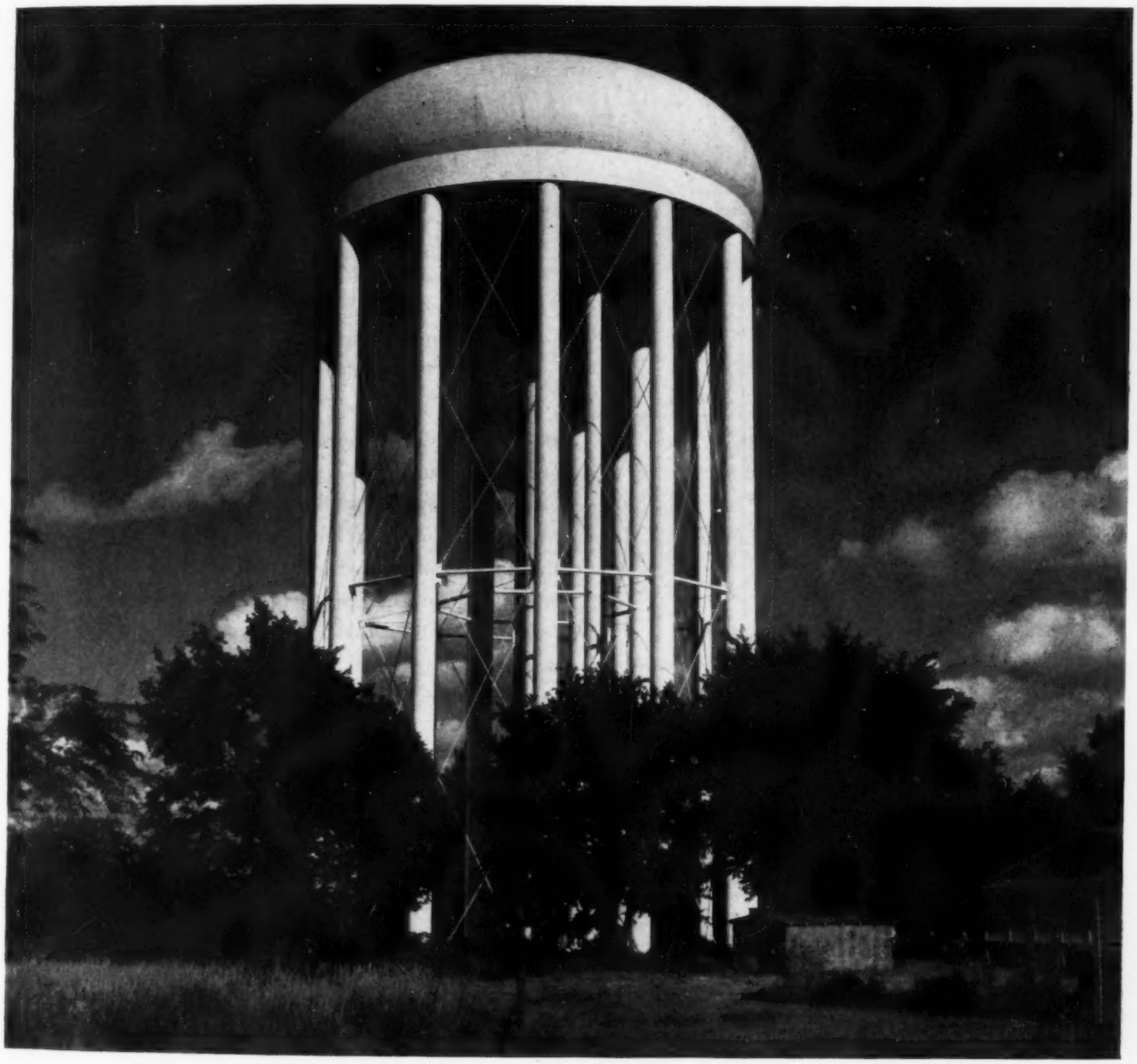
ELECTRIC FURNACE QUALITY ALLOY AND STAINLESS STEEL PRODUCTS

New ELEVATED TANK eases the load on Columbia's power plant

Columbia, Missouri, obtains several distinct benefits from its new 1,000,000-gallon Horton spheroidal elevated tank. One of them is the reduction of pumping costs. This is accomplished by eliminating the necessity of pumping during a three to four hour period in the evening when the peak electric load is on the municipal power plant. The tank has sufficient capacity so that the high service pumps may be shut down during this period, thus relieving a portion of the demand on the boilers. The tank is refilled at off-peak periods, utilizing surplus power plant capacity and thus reducing power costs.

Columbia's water supply is taken from three deep wells ranging from 1200 ft. to 1500 ft. in depth. The water is pumped into underground reservoirs having a capacity of 4½ million gallons and repumped from these reservoirs into the distribution system by steam-driven service pumps.

In addition to reducing pumping costs and improving water pressures, this elevated tank, together with two new fire stations and larger mains in several areas, is expected to lower the insurance premiums an estimated $60,000 to $75,000 per year for the residents of Columbia.



Write for quotations on Horton elevated water tanks to meet your requirements.

CHICAGO BRIDGE & IRON COMPANY

Birmingham 1	1586 North Fiftieth Street	Cleveland 15	2262 Guildhall Bldg.	Philadelphia 3	1644-1700 Walnut Street Bldg.
Houston 2	2115 National Standard Bldg.	Los Angeles 14	1455 Wm. Fox Bldg.	Atlanta 3	2181 Healey Bldg.
Tulsa 3	1646 Hunt Bldg.	Chicago 4	2198 McCormick Bldg.	Havana	402 Abreu Bldg.
New York 6	3390—165 Broadway Bldg.	San Francisco 11	1283-22 Battery Street Bldg.	Detroit 26	1551 Lafayette Bldg.

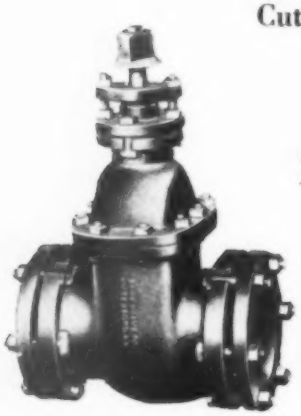
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA

GOOD-BYE...

Old-fashioned, Cumbersome and Costly Methods of Cutting-in Valves into Existing Lines

AT LAST...

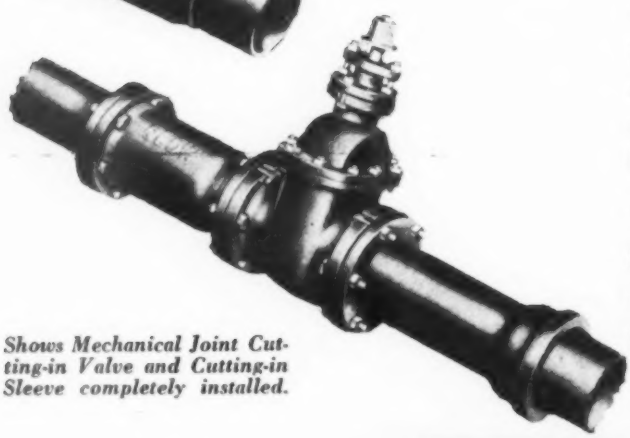
NEW Eddy (Pat. pending) Mechanical Joint Cutting-in Valve and Cutting-in Sleeve Gives You Completed Installation:—



Eddy Taper seat A.W.W.A. Cutting-in Valve

- ★ **QUICKLY (in less time); with**
- ★ **LESS LABOR (smaller Crew needed); at**
- ★ **LOW COST (needs no lead, no jute, no caulking, no skilled workmen—just a man with a ratchet wrench); and**
- ★ **NO DELAY (Wet trench, even underwater, does not interfere).**

Mechanical Joint Cutting in Sleeve



Shows Mechanical Joint Cutting-in Valve and Cutting-in Sleeve completely installed.

Most Systems need more Valves. Now, a year round program of Valve installation into existing lines can be undertaken easily, positively, and economically. Auxilliary Valves should be cut-in hydrant leads for convenience in inspecting, repairing and replacing. Another benefit, is that Valves can be installed during stand-by, or slack periods, thereby keeping crews intact.

You are invited to acquaint yourself with the fully demonstrable advantages, low cost benefits, and all details. Write for completely illustrated, descriptive brochure.

EDDY VALVE COMPANY

Waterford, New York

(Subsidiary of James B. Clow & Sons)

Eddy For Long Service

No lead, no furnace, no jute—just a man with a ratchet wrench—and "bottle tight" in only 56 minutes.

IT'S RESULTS THAT COUNT!

Welcome News to Operators, Engineers and Superintendents is the knowledge and certainty that after the excavation is completed, they can now cut-in and install a Valve and have the Line in service and "bottle tight" in 56 minutes or less. (Read letter to right.)

PERFORMANCE IS PROOF

The eye-witness account and report of "What happened", and the conclusions arrived at, are incorporated in the letter reproduced below.

City of Waukesha

WATER UTILITY

A. P. KURANZ, Manager

Utility Commissioners
J. G. Laing, President
E. M. Juneman, Secretary
John B. Randle

Edwin H. Honeyager, Mayor
H. G. Newman, Council Representative

Beautiful Waukesha—Famous for its Water and Health, Homes, Industries, Rest and Recuperation . . . Railroads, Churches, College and Schools . . . Capitol of the Dairy Industry.

Waukesha, Wisconsin
March 30, 1948

Eddy Valve Company
Waterford, N. Y.

Gentlemen: Attention: Mr. Geo. P. O'Day, V.P.

A remark by one of our men..."like shooting fish in a rain barrel"...about describes our recent experience of installing your new Eddy mechanical joint valve and cutting-in sleeve combination into an existing hydrant lead, size six inches. While our men had never "tackled" a similar job, the work progressed rapidly and the results were one hundred percent perfect.

After the excavation was completed, we made two cuts in the hydrant lead with a ratchet cutter. The first cut took twenty minutes, the second cut fifteen. The valve and sleeve were then lowered into the trench with a rope sling and the installation completed in just twenty-one minutes - with only a ratchet wrench. Thus, in elapsed time of fifty-six minutes, two cuts were made in the pipe and your valve and sleeve inserted in the line. Water was turned on immediately and in eighteen minutes we had full pressure on the line and hydrant. All joints were "bottle-tight."

This type of mechanical joint equipment has several outstanding advantages for cutting in a valve in an existing line. No time is lost in waiting for a line to be completely emptied, as would be the case with slow drainage or a leaky valve. Water in the trench or bad weather conditions are of no concern. The work can be done by inexperienced men. No lead or lead melting and handling equipment are required on the job. Also, considerable time and labor will be saved through the use of your mechanical joint products.

Our Utility will most certainly make general use of this new Eddy cutting-in valve and sleeve for all work of this kind - from now on. We commend your product to others who may be interested in cutting a valve into an existing line.

Yours very truly,

A. P. Kuranz

A. P. Kuranz, Manager
WAUKESHA WATER UTILITY

Excavation completed. Ready are: Eddy Mechanical Joint Cutting-in Sleeve, Glands, and Cutting-in Valve.

LIFE *begins at* 32!

Originally laid in 1915, a mile of 10-inch Acipco pipe was taken up recently after having served as a water line for 32 years. Being no longer needed for water supply, the pipe was moved to a new location and installed for gas service, as shown in the accompanying illustration.

When taken up the pipe was found to be in excellent condition—impressive evidence of the low cost of Acipco pipe per service year. Salvage value is an item which should not be overlooked. Frequently, increased demand makes it necessary to replace smaller cast iron pipe lines with larger mains; and when the pipe is removed from the ground it is found "as good as new". Acipco pipe has high salvage value, and its rugged, long lasting qualities make it in great demand.

Today, as always during the past, Acipco offers quality pipe and fittings plus experienced personal service. Detailed information will be furnished on request.

AMERICAN
CAST IRON PIPE
COMPANY

Birmingham 2, Alabama

Well cracked sludge bed shortly after Aluminum Sulfate treatment

GENERAL CHEMICAL ALUMINUM SULFATE

Speeds Sludge Drying

General Chemical Alum speeds sludge dewatering and drying on sand beds . . . capacity of beds may be doubled, even tripled . . . quick removal lessens chance of odor and fly nuisance . . . reduced volume of cake decreases cost of removal. Sewage works operators the nation over count on the benefits obtained from low cost Alum treatment throughout the year.

Why not learn what General Chemical Alum will do in your plant too? Full information may be obtained quickly from the nearest General Chemical Office listed below.

BASIC CHEMICALS

FOR AMERICAN INDUSTRY

GENERAL CHEMICAL DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N. Y.

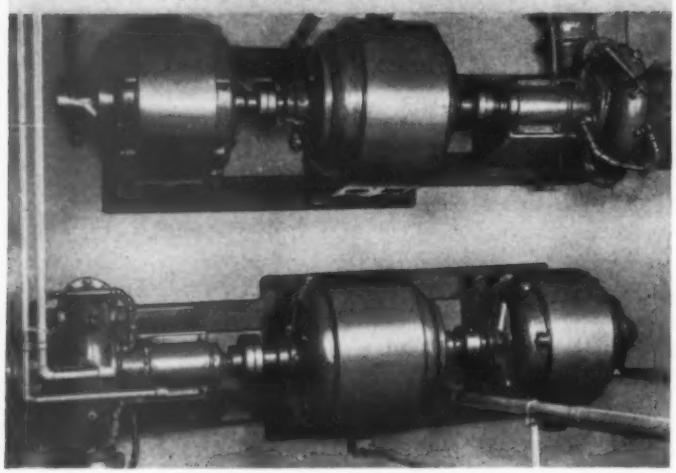
Offices: Albany • Atlanta • Baltimore • Birmingham • Boston • Bridgeport • Buffalo Charlotte • Chicago • Cleveland • Denver • Detroit • Houston • Kansas City Los Angeles • Minneapolis • New York • Philadelphia • Pittsburgh • Portland (Ore.) Providence • San Francisco • Seattle • St. Louis • Wenatchee • Yakima (Wash.)

In Wisconsin: General Chemical Company, Inc., Milwaukee, Wis.

In Canada: The Nichols Chemical Company, Limited • Montreal • Toronto • Vancouver

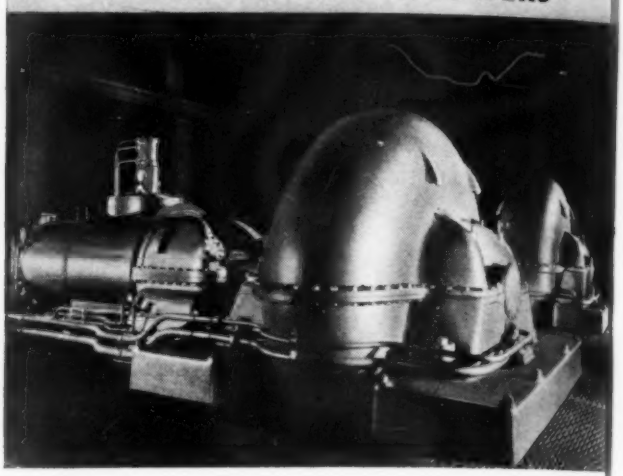
World's Widest

CENTRIFUGAL PUMPS



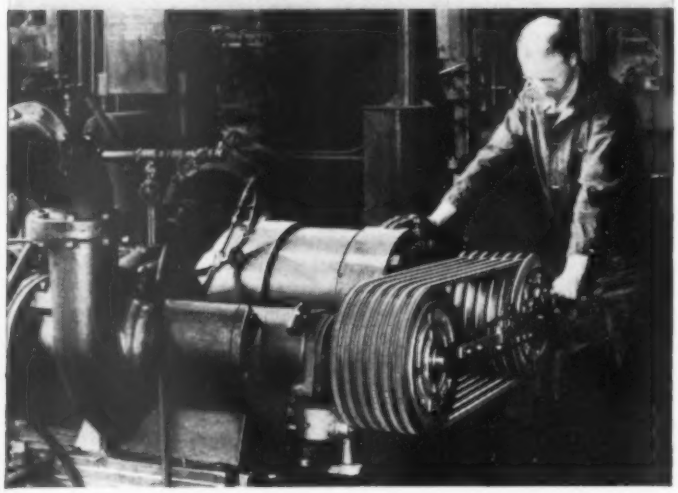
SEWAGE BOOSTER STATION in midwest municipality uses A-C pump-motor "team." Dual motors provide capacity and head variation. Allis-Chalmers builds all types of pumps for water and sewage works, fire protection, drainage and other public works. Capacities range up to the largest size.

TURBINES AND BLOWERS



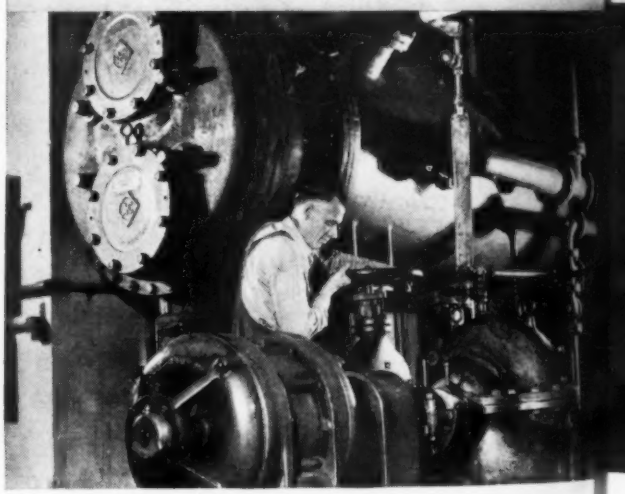
ALLIS-CHALMERS turbine-driven centrifugal blowers in Milwaukee sewage treatment plant. A-C builds multi-stage blowers up to 130,000 cfm, 35 psig; single-stage—600 to 35,000 cfm. 1 to 6.25 psig; rotary compressors—44.5 to 1,684 cfm, 5 to 35 psig; vacuum pumps—14.5 to 5,300 cfm, 18 to 28.5 in. hg.

MULTIPLE V-BELT DRIVES



TEST FLOOR VIEW of centrifugal pump with Vari-Pitch Texrope speed changer. This unit now controls the sludge level in ferric chloride dosing tank in a midwestern sewage plant, with pilot operation instead of manual as shown. A-C V-Belt drive line includes all sizes and types for all applications.

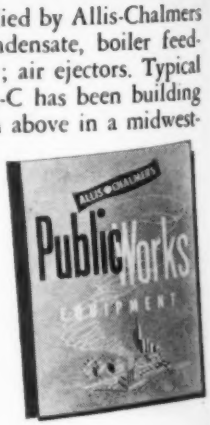
SURFACE CONDENSERS



POWER STATION equipment supplied by Allis-Chalmers includes turbines; condensers; condensate, boiler feedwater and circulating water pumps; air ejectors. Typical of the power plant installations A-C has been building for over 40 years is the one shown above in a midwestern sewage plant.

SEND FOR NEW PUBLIC WORKS BULLETIN

Description of A-C equipment — published for Public Works engineers. Send for your copy today. Bulletin 25B6607, ALLIS-CHALMERS, MILWAUKEE 1, WIS.



Range OF MAJOR PUBLIC WORKS EQUIPMENT!

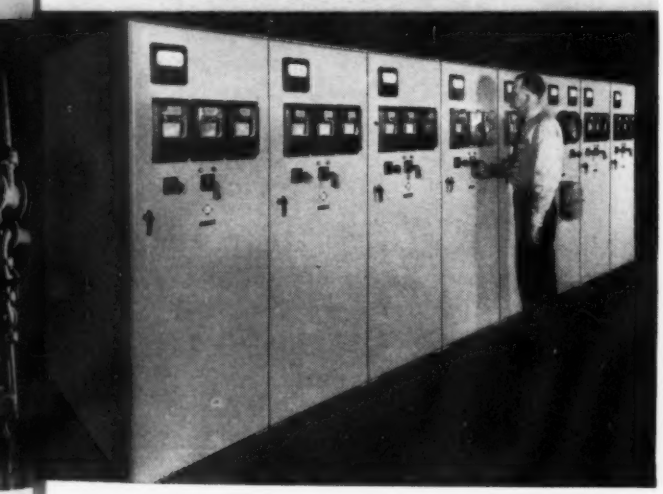
At Allis-Chalmers You Get Complete *Coordination* of All Electrical and Mechanical Equipment

WHAT DOES THIS LEADERSHIP in range of public works equipment mean to you? It means that you can get individual units of equipment *tailor-made to work together* . . . designed and built by one company.

Engineers know that for maximum efficiency, equipment must work as a team—*the right drive for the right pump—the right control with the right motors.* It is this coordination of equipment that saves you money and engineering worries. No other company offers you this kind of equipment engineering. No other company can supply you with so many different types of major equipment with emphasis on making them work together as an efficient team.

Whether you are planning to modernize or expand, call on Allis-Chalmers. Get in touch with your nearest A-C office or write to ALLIS-CHALMERS, MILWAUKEE 1, WIS.

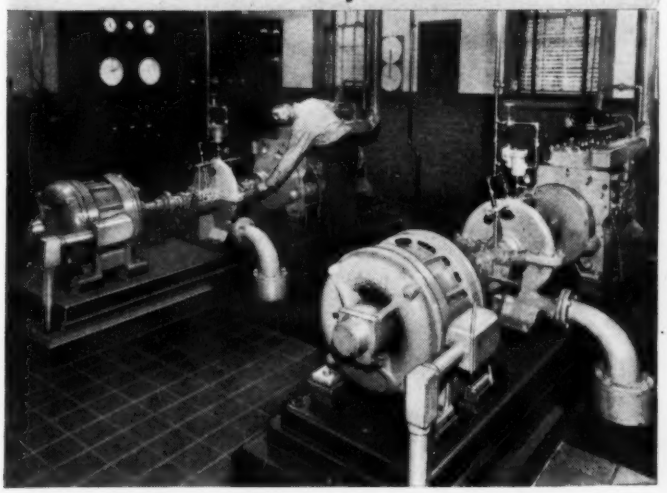
POWER DISTRIBUTION



METAL-CLAD SWITCHGEAR was introduced to the U. S. by Allis-Chalmers . . . and today "A-C" offers a complete line for all applications. Electrical products include motors, transformers, circuit breakers, unit substations, motor-generator sets, mercury-arc rectifiers, switchboards and industrial control.

A 2432

MOTORS AND CONTROL



EAST COAST CITY depends on Allis-Chalmers motors. It's easy to see why — the Allis-Chalmers line of motors for public works ranges from one hp up to the largest size for all applications. A-C can also provide dryers, screens, sifters, roller mills and other processing machinery for sludge disposal.

Texrope and Vari-Pitch are Allis-Chalmers Trademark.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment—Biggest of All in Range of Industrial Products

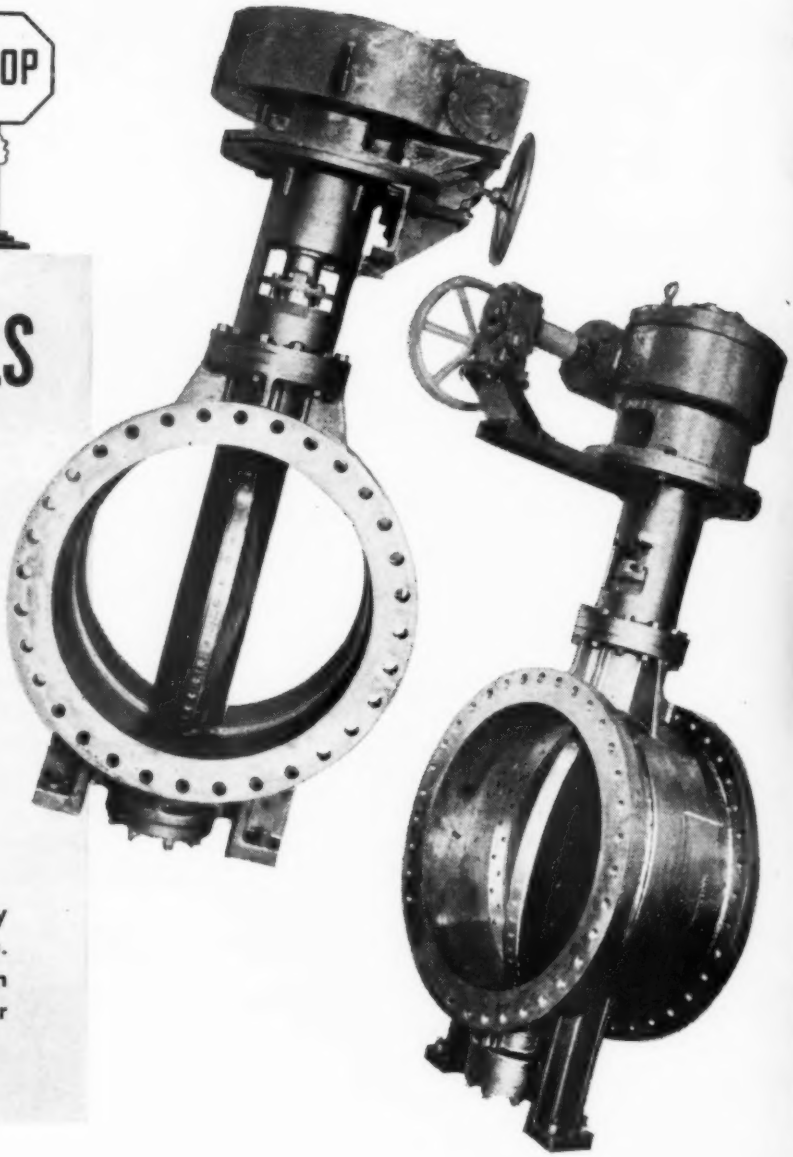
TRAFFIC CONTROLS

for San Diego water supply

fitted with *Everdur*

AND BRONZE

Key parts of these 36" and 42" butterfly valves are made of Everdur and Bronze. Valves made by Coldwell-Wilcox Division of Krajewski-Pesant. Hydraulic Engineer for the city of San Diego: Fred D. Pyle.



DOWN from the Alvarado Regulating Reservoir rushes the water supply for San Diego, California, under 100 lb. pressure. Among the controls for this man-made underground river are these two butterfly valves, 36" and 42" I.D., which together weigh 16,000 lbs.

Many vital parts of these valves are made of Everdur* Copper-Silicon Alloys to insure long, dependable service. The shafts (respectively 5" and 5½" diam.) and seating rings in the body and in the disc are of Everdur. The ⅝" seating rings are fastened with Everdur screws. The stuffing box followers are of bronze with Everdur bolts throughout.

Why was Everdur chosen for this critical service? Because these famous alloys have proved thoroughly reliable in hundreds of water and sewage works applications. As a group, Everdur Alloys combine excellent corrosion resistance with high tensile strength, high fatigue limit, and good workability by all methods, including welding.

It pays to be familiar with the many ways in which you can take advantage of Everdur Alloys. For detailed information, write for Publications E-11 and E-5. 48184

*Reg. U. S. Pat. Off.

ANACONDA
from mine to consumer

Everdur

COPPER-SILICON ALLOYS

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD.
New Toronto, Ont.

ONE

Fairbanks-Morse Single-Stage, Split Case Centrifugal Pump—for dependable, high-head service.

When your job demands a multi-stage pump, the Fairbanks-Morse pump expert will recommend the right one from among the broad line built by *his* company . . .

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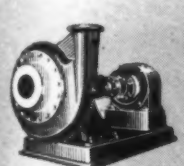
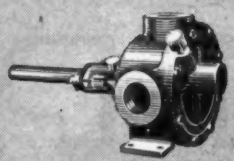

Trash Pumps

Side-Suction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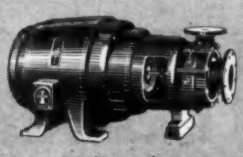
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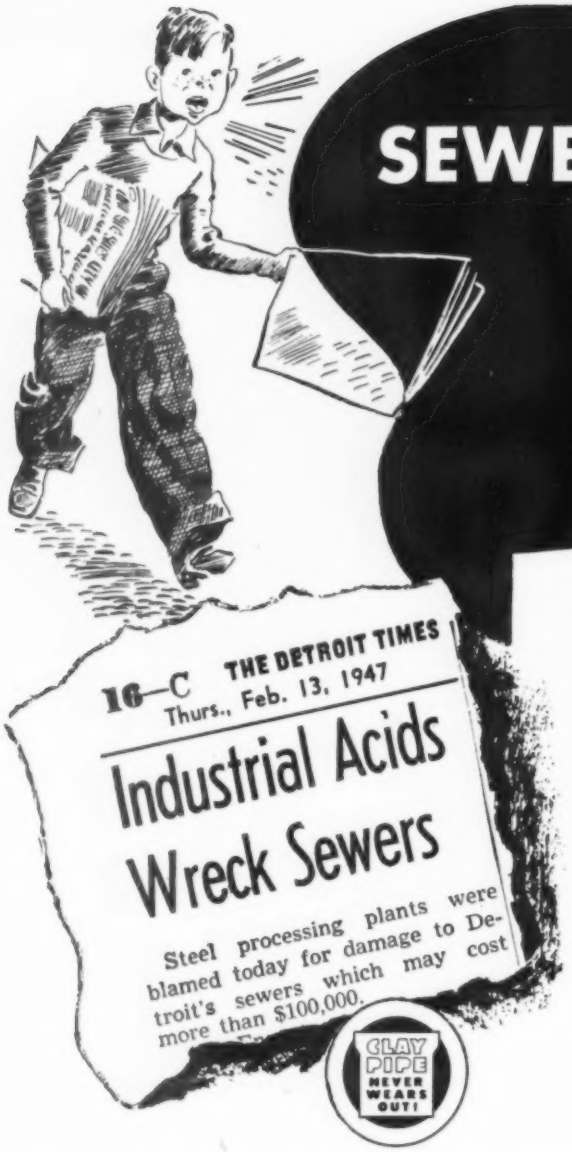
16—C THE DETROIT TIMES
Thurs., Feb. 13, 1947
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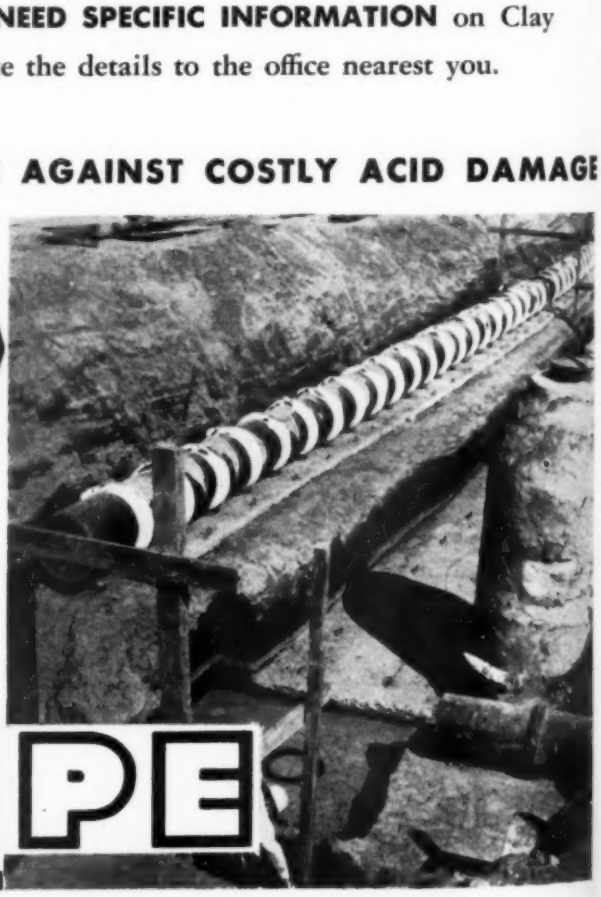

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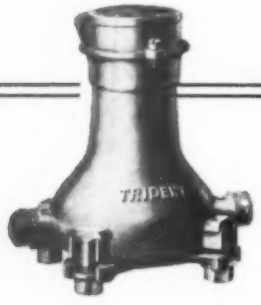

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WATER & SEWAGE WORKS

VOL. 95. NO. 5 MAY. 1948

A Gillette Publication

DIGESTION OF SEWAGE SOLIDS

A Review of Established Methods; Comparisons and Comment

UNHEATED SLUDGE DIGESTERS

The Third Article of a Series

by LeROY W. VAN KLEECK
Sanitary Engineer
HARTFORD, CONN.

THE 1938 "Committee on Sludge Digestion" of the American Society of Civil Engineers states that there is doubt as to the first use of the method known as separate digestion. In 1884, however, separate digestion tanks were used in tests at London, England, and again at the Lawrence Experimental Station of the Massachusetts Department of Public Health in 1899. While Imhoff tanks led the field in this country during 1910 to 1920, the trend since 1920 has been toward the adoption of the separate system of sludge digestion.

Factors in the Selection of Unheated Digesters

While the general factors previously discussed for the septic tank and Imhoff tank must be considered, the decision to use unheated separate digesters also involves the variety of uses under which they may be employed. These are as:

1. Rectangular or possibly circular units with gravity transfer of raw sludge from adjacent hopper-bottom plain-settling tanks.

2. Elevated open-top units, usually circular, to which raw sludge is pumped from either hopper-bottomed settling tanks or tanks equipped with conventional scraper mechanisms.

3. Circular open-top units used as secondary units following primary digestion of raw solids (two-stage digestion).

The Author

4. Circular and sometimes rectangular covered units, also used as secondary units following primary digestion of raw solids. Such units may have fixed covers, floating covers, or a gas-storage holder which rises and falls with the gas volume in storage. In most cases the sludge gas is collected and utilized.

Methods No. 3 and No. 4 are so closely tied in with heated separate sludge digesters that the factors influencing their use, together with their design and operation, will be discussed in Part IV of this series.

Plant Location

A site suitable for a septic tank or Imhoff tank plant will be suitable for unheated digesters. Because of the advantage of separate control of the sewage settling and digestion processes, carrying odors from this type of plant should be under better control than with Imhoff tanks.

Connected Population

The unheated digester is a competitor of the Imhoff tank in the 1500 to 5000 connected population range. Below 1500 population the writer favors the septic tank for reasons discussed in Part I. Between 1500 and 5000 population, unheated digesters have their field of greatest usefulness. The cost of operation and maintenance is low, although generally not as low as for Imhoff tanks handling the same population. As the connected population increases above 5000, a point is reached, when gas utilization in heated digesters becomes a factor. Such heating reduces materially the volume of digestion space required and while the gas production in winter may not be sufficient to supply all heat requirements of the digesters and operating building, it will be sufficient, coupled with standby fuel, to warrant the shift.

Character of the Sewage

With proper design and operation, the efficiency of sewage sedimentation is assured by the plain-settling, separate-sludge digestion type of plant. As with Imhoff tanks, however, harmful industrial wastes, such as copper, chromium or wool fibre, in toxic or excessive quantities, must not be present or digestion will be unsatisfactory and nuisance develop.

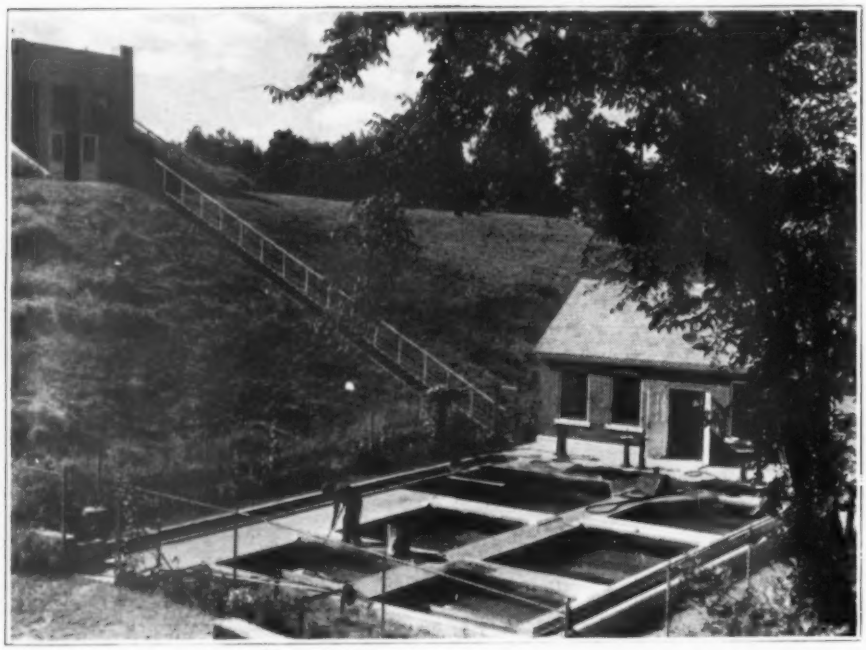


Fig. 1. Small Plain-Settling Unheated Separate Sludge Digestion Type Plant, North Manchester, Conn.

(Digester is on hill with operating gallery showing. Settling tanks have sludge scrapers.)

Designers of modern sewage treatment plants have a responsibility to their clients to ascertain that no such wastes are present in the sewage or to take steps to pre-treat or exclude them.

Operating Personnel and Cost of Operation

The performance of septic tanks and Imhoff tanks is not likely to be so adversely affected by deficiencies in operating personnel as is the separate digestion system. This, coupled with lower operating costs, is why the author has favored the septic tank and Imhoff tank for the small community, institution, or factory.

Operators of unheated digester type plants must frequently have mechanical ability, be able to perform simple laboratory tests, keep records, and give routine attention to the plant. With these qualifications they generally command a higher salary than operators of septic or Imhoff tanks handling the same population.

Pertinent Design Requirements

1. Provision should be made for screening and removal of grit from the sewage flow. This requirement should apply to all sewage treatment installations of any size except some septic tanks (see Part I). Grit chambers are needed whether or not the collecting system is on the separate plan. Two or more narrow hand-cleaned grit chambers should prove satisfactory. Hand-cleaned screens should give way to mechanical screens or disintegrators for connected populations above 5000.

2. The minimum sludge storage capacity should be 3.5 cu. ft. per capita and preferably 4 to 5 cu. ft. With the addition of humus sludge the minimum allowance should be 4.5 cu. ft. per capita. The addition of waste activated sludge to such tanks cannot be recommended.

3. The valves on gravity sludge transfer pipes between adjacent plain-settling and unheated separate digesters should be protected from freezing. This is a frequent operating headache in northern climates. Submergence of the valves in sewage will generally prevent trouble.

4. With gravity sludge transfer pipes, the digester discharge should be visible at maximum liquid elevation in the digester. This enables an operator to see the character of the raw sludge being drawn. A 90 degree fitting with extension piece can be used if required. Minimum withdrawal head for sludge transfer should be four to five feet.

5. The digester top should be fully accessible for scum plunging. Treated plank covers are suitable for rectangular units fed by gravity sludge lines. Eventually, of course, such covers rot. Covers improve the appearance, reduce carrying odors, and keep out ice and snow. Sections of the cover can be left in place, when working on the tanks.

With larger circular tanks, elevated above ground level, and to which raw sludge is pumped, covers are not necessary, since normal gas odors are readily dissipated into the air, the top surface is not visible to a ground observer and in northern climates the scum can be left undisturbed until the ice and snow melt in the spring. Open top tanks require, however, a concrete walkway or wide heavy planking (minimum width two feet) for scum plunging operations, and should furthermore be surrounded by a high substantial fence to prevent accidents to trespassers, not to mention the protection it affords the digester from foreign objects being thrown into it.

6. Scum and sludge levels in small rectangular digesters can be determined with a type of sludge sounder described under Imhoff tanks. Large circular digesters to which raw sludge is pumped should preferably be designed with an operating gallery accessible at grade in which is located the supernatant and sludge draw-off piping, control valves, and a sampling sink. The sink should be at least 18 inches deep, have a 3-inch drain, and be supplied with 1¼ or 1½ inch sampling pipes with quick opening valves from the various digester levels. A water supply not cross connected with a potable water supply should be piped to the gallery for back-flushing clogged lines and rinsing the sink. The gallery should be heated. If the operating building is built adjacent to the tank, a portion of this building can be utilized as a pipe and sampling gallery, thus saving the cost of a separate gallery.

7. Rectangular digesters adjacent to settling units should have a minimum water depth of 8 feet, preferably 10 feet. Circular tanks for larger plants, to which sludge is pumped, should be at least 20 feet in depth and are frequently deeper.

8. Decanting pipes at 2 to 3 foot intervals should be provided throughout the normal zone for scum and supernatant liquor storage. The liquid level of rectangular digesters adjacent to settling units is of necessity below that of the settling units. Supernatant liquor is best handled at these small plants by drawing it on to one or two sludge beds reserved for this purpose. Pumping of the supernatant to the raw sewage not only requires additional equipment but the low flow at such plants

affords insufficient dilution for the liquor. A means for discharging skimmings from the settling tanks to the digester is convenient. A handy arrangement is illustrated in Fig. 4.

Supernatant from elevated circular digesters can be returned at a slow rate to the raw sewage flow, but an alternate arrangement for draining on sludge beds is desirable. Slow rates of return can be secured by utilizing the small sampling sink pipes instead of the larger decanting pipes. At least two of the supernatant liquor draw-offs should be of 8-inch pipe, one located about a foot below maximum high water and the other about 3 feet lower. *These pipes can then be used to draw off partially digested liquid scum, which has been previously broken up, to the sludge beds.*

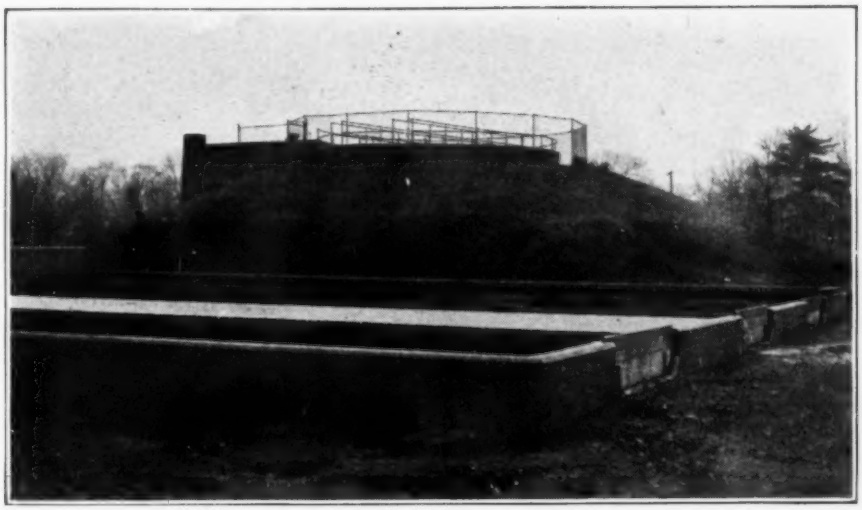


Fig. 2. Open Top Unheated Digester with Sludge Beds in Foreground

(Note fence and attached operating gallery. Plain settling tanks and pump house not visible.)

Pertinent Operating Features

1. Open unheated digesters present no explosion hazard and very little fire hazard. This safety feature, coupled with the omission of gas-fired boilers, meters, flame traps, pressure regulators and condensate traps, simplifies operation. Less knowledge and mechanical aptitude are thus required of the operator than with heated digesters.

2. These units should preferably be started in the north during early spring or summer. The exact procedure will be discussed in detail under Part IV on "Heated Digesters."

3. Seed sludge must be kept in these units as with Imhoff tanks. The sludge level should be drawn down in the fall in the north to provide storage during the winter when very little digestion will occur. At best, tank temperatures will not exceed that of the raw sewage, and will fall lower in exposed locations. It is always wise to have several clean sludge beds ready to receive sludge in winter in case some sludge must be drawn. When sludge of suitable drying quality is obtainable during favorable drying weather it should be drawn in *limited* amounts *frequently*.

4. Raw sludge through gravity lines should be drawn *slowly* to the digester until water streaks are visible. Samples of the sludge should be observed at close range, if necessary, to cut down on the overflow liquor volume. The sludge in plain-settling tank hoppers should be squeegeed down the sides of the hoppers; otherwise, the sludge will not be effectively removed and a build-up of solids on the sides of the hoppers will occur with subsequent rising of sludge masses, especially during warm weather. After sludge has been drawn from all hoppers, a second short drawing is often beneficial. With mechanically-cleaned settling tanks, sludge removal follows the usual pattern.

5. Supernatant should be drawn from the level shown by sampling to contain the lowest solids content. A simple test for small plants with limited laboratory equipment is to settle a sample of the supernatant in a graduated cylinder for one hour. Solid accumulations under 5 per cent by volume indicate a good liquor; readings to 10 per cent can generally be returned to the raw sewage flow without operating difficulties, especially if returned at a slow rate or if the sewage flow is sufficient to provide good dilution. Liquor containing more than 10 per cent solids by volume should be sent to sludge beds or retained if possible. Supernatant liquor is generally drawn once or twice a week to make room for the addition of fresh sewage solids. Automatic overflow of supernatant during raw sludge additions is generally neither necessary nor desirable.

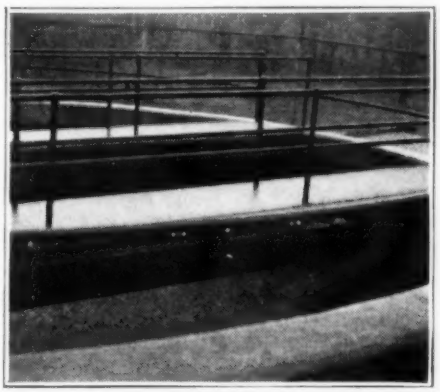


Fig. 3. Same Digester as in Fig. 2

(Showing walkways and safety railings. Note broken up condition of scum which is about one foot thick and ready for drawing to sludge beds.)

6. Scum floating on the digester surface should be worked with a light wooden plunger or similar tool, or occasionally, if required, broken up with water, sewage, or supernatant liquor under pressure. The use of supernatant is preferable. When a foot or more of semi-liquid scum has accumulated it can be drawn off through the supernatant pipes recommended under design requirements. This will rid the tank of floating hair, match sticks, rags, and other slow digesting material. By promotion of scum digestion through routine submergence of it, the material will be black and have no appreciably greater odor than bottom sludge. The drying time on the sludge beds will usually be longer than for bottom sludge drawn to the same depth, because of the character of the material.

Lime in judicious quantities will often aid in settling scum and promoting better digestion. Its use is by no means always necessary, nor should it be used unless a real need is evident. The pH of the sludge may be allowed to drop to 6.4 or 6.5 before adding lime. In the interim every effort should be made to promote digestion by submerging scum, maintaining plenty of seed sludge, adding raw sludge in proper quantities at regular intervals and recirculating the tank's contents if the

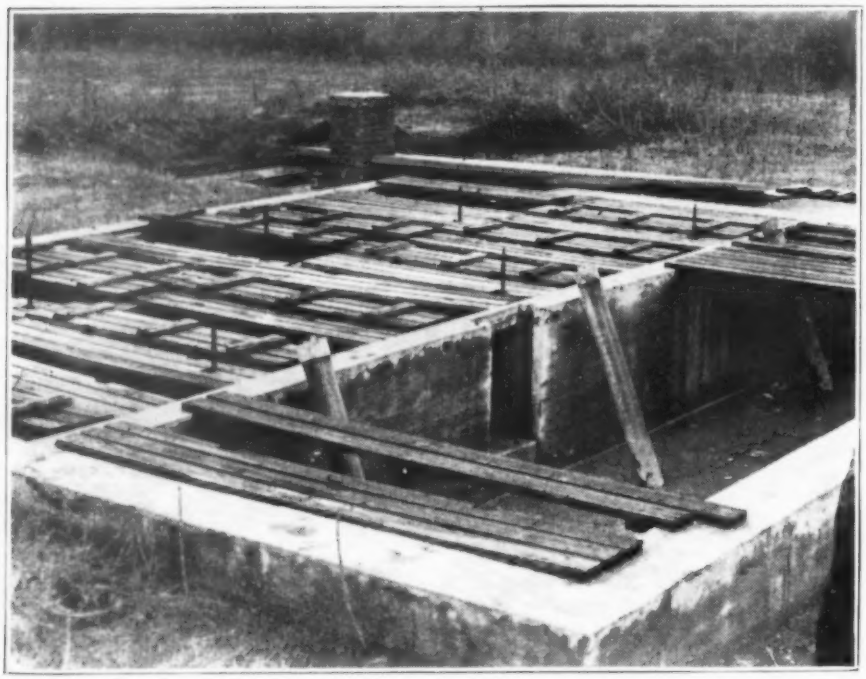


Fig. 4. Small Gravity Sludge Transfer Type of Separate Digester

(Settling tank in foreground, separate digester to left. Note sludge riser pipes, scum draw-off port between settling tank and digester and sludge beds in distance.)

pH or total alkalinity values are widely different in various zones of the tank. While the writer does not subscribe to the theory of artificial maintenance of high pH values with lime, he does believe that lime has a definite use in sludge digestion. This matter will be discussed in detail in Part IV.

7. Odors from these tanks, when properly operated and not subjected to overload, are not offensive and are generally confined to the immediate vicinity of the tank. Frequently no odor can be detected at the base of elevated open-top tanks.

8. Table I below gives the results of some analyses of digested sludge from unheated separate-sludge digesters in Connecticut. It will be observed that most of the results compare favorably with what is considered well-digested material. In some cases the high alkalinities and fixed solids reported are partially the result of lime additions, admittedly excessive in some instances. Other tanks have been operated with little or no lime.

Conclusion

Unheated separate-sludge digesters have a field of usefulness for small communities and institutions. Routine operating attention on an intelligent level must be provided to produce satisfactory results. Such operation coupled with proper design will produce sludge of satisfactory quality.

Table I

ANALYSES OF SLUDGES FROM UNHEATED SEPARATE SLUDGE DIGESTION TANKS

Sample No.	% Moisture	% Fixed Solids	% Volatile Solids	Alkalinity, ppm.	Color	Odor
1	93	61	39	3500	Brown	Tarry
2	70	82	18	1600	Black	Tarry
3	95	56	44	3200	Brown	Tarry
4	91	46	54	630	Black	Tarry
5	95	50	50	1000	Black	Tarry
6	87	59	41	4400	Black	Tarry
7	90	51	49	900	Black	Tarry
8	93	43	57	2600	Brown	Tarry

On Giving the Devil His Dues

(From a Letter to the Editor)

Sir:

I have just read with considerable interest and profit the interesting article in your March issue on sludge digestion by Mr. Leroy W. Van Kleeck.

I have always felt that the simpler septic tank, if given just half a chance, would work as well as many more complicated structures. I differ from Mr. Van Kleeck's analysis in only one particular, namely, the question of handling scum. This is a matter to which I have given considerable thought, and am convinced that if the scum is broken up, as by a moderate stream of water or sewage, it will eventually digest and settle to the bottom. Scum is always composed of partly digested material and therefore, if discharged, will produce some local nuisance until decomposition is complete. For this reason I do not believe it would be necessary to provide scum draw-off, as suggested in design requirement No. 3.

In operating requirement No. 2 I believe the application of lime would be found unnecessary. If the surface is broken up with wooden plungers or a hose without the lime, I believe the scum will disappear just as well as or better than it would if lime were added.

May I compliment you on publishing this very valuable article, and express my anticipation of the remaining articles in the series.

Yours very truly,

A. M. Buswell, Chief,
STATE WATER SURVEY,
URBANA, ILL.

Correction!!

Le Roy W. Van Kleeck, whose articles on sludge digestion are currently appearing in *Water & Sewage Works*, has called attention to an error which appeared in the first installment of the series. On page 104 of the March 1948 issue, under "Available Methods," the number of methods should read "five" instead of "four."

On page 106, Table I, Column 3, it should read 8 year period, not 8 hr. period.

San Diego to Enlarge Sewage Treatment Works

The City of San Diego is receiving bids on May 25 for enlargement of its Sewage Treatment Works. The present plant, constructed in 1942, has already become inadequate to handle the existing population, now more than 365,000, and practically double that when the plant was built.

The new plant will use most of the old structures and enlarge their capacities. Pumping will be done by gas engines operated on digester gas. Preaeration for odor control will be used.

The plant will have a capacity of 40 mgd. for average flow, and 70 mgd. for maximum flow.

Major items of new work will include two 180 ft. diameter clarifiers with 30 ft. aeration tanks around the clarifiers, and three 100 ft. diameter digestion tanks. Elutriation tanks are also to be included.

USE OF WELL POINTS FOR TRENCH DEWATERING

Materially Facilitated Construction of Large Trunk Sewer

By A. M. RAWN*
Chief Engr. & Genl. Mgr.
Los Angeles County Sanitation Districts
LOS ANGELES, CALIF.

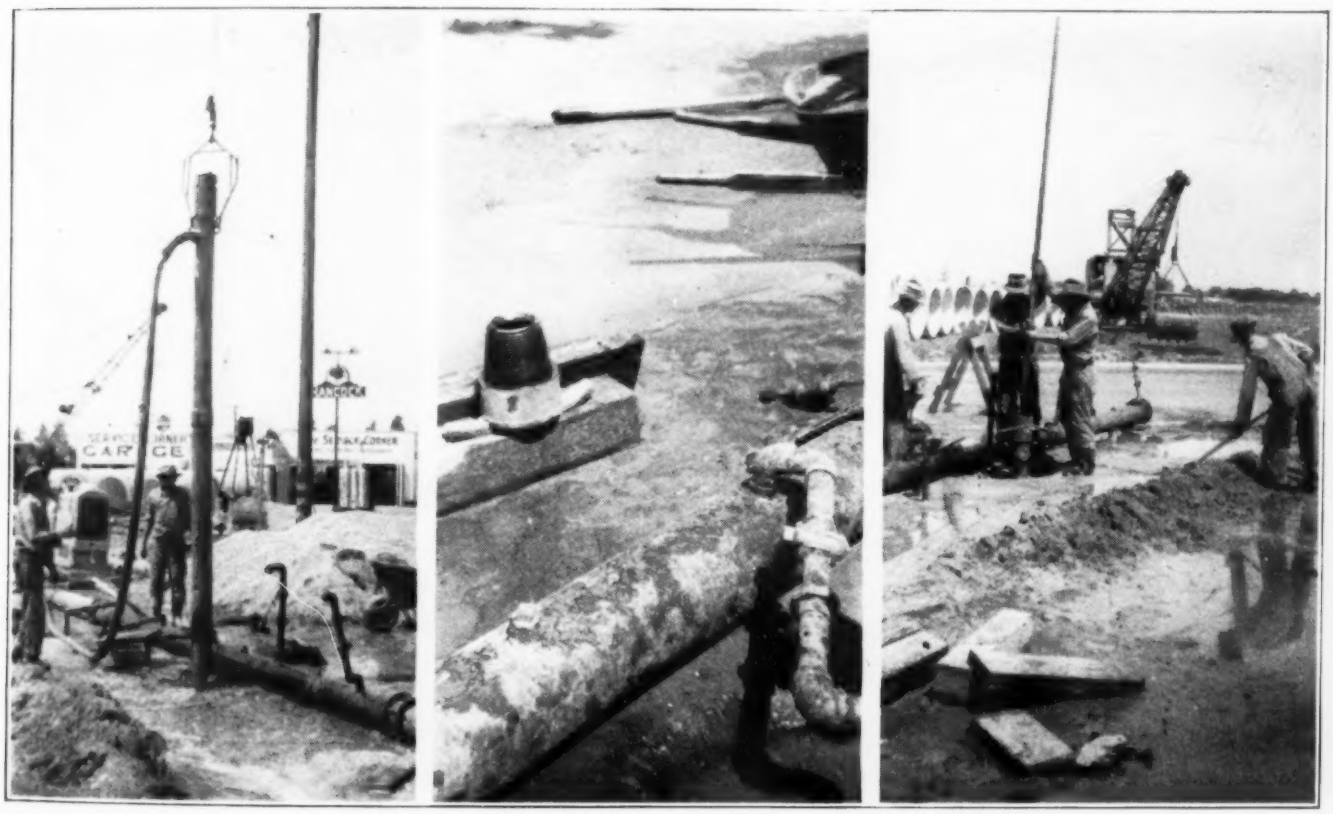
THIS is a story of a large diameter sewer constructed in wet, sandy, and sandy-loam soil where ground water was close to the ground surface. The story is told almost entirely in pictures and is intended to illustrate the use and utility of well points in construction of this kind.

Views are taken on two jobs rather widely separated but with much the same characteristics. The sewer under construction is the main separate sewer outfall leading from the San Gabriel Valley east of the City of Los Angeles to the disposal works of the Los Angeles County Sanitation Districts near Harbor City. For about fifteen miles the sewer generally parallels the east bank of the Rio Hondo River varying from a location directly in the outer toe of the east control embankment to a mile or so distant. The line crosses under the river twice. Throughout its length it is constructed in river sand and gravel, in some instances, mixed with loam with occasional lenses of clay and peat.

The Author

*Editorial Associate
Water & Sewage Works

For about five miles of its length ground water was well above the invert grade of the sewer, at times ris-



Putting Down Well Points

The above photo shows jetting holes for well points. The jetting pipe which is suspended from the crane boom is 6 in. in diameter and is fed by the hose line.

Three important elements. Connection from 2 in. well point riser to 8 in. suction manifold. Cap to close top of 6 in. jetting pipe is on blocks. A well point is seen beyond wheel-barrow handles.

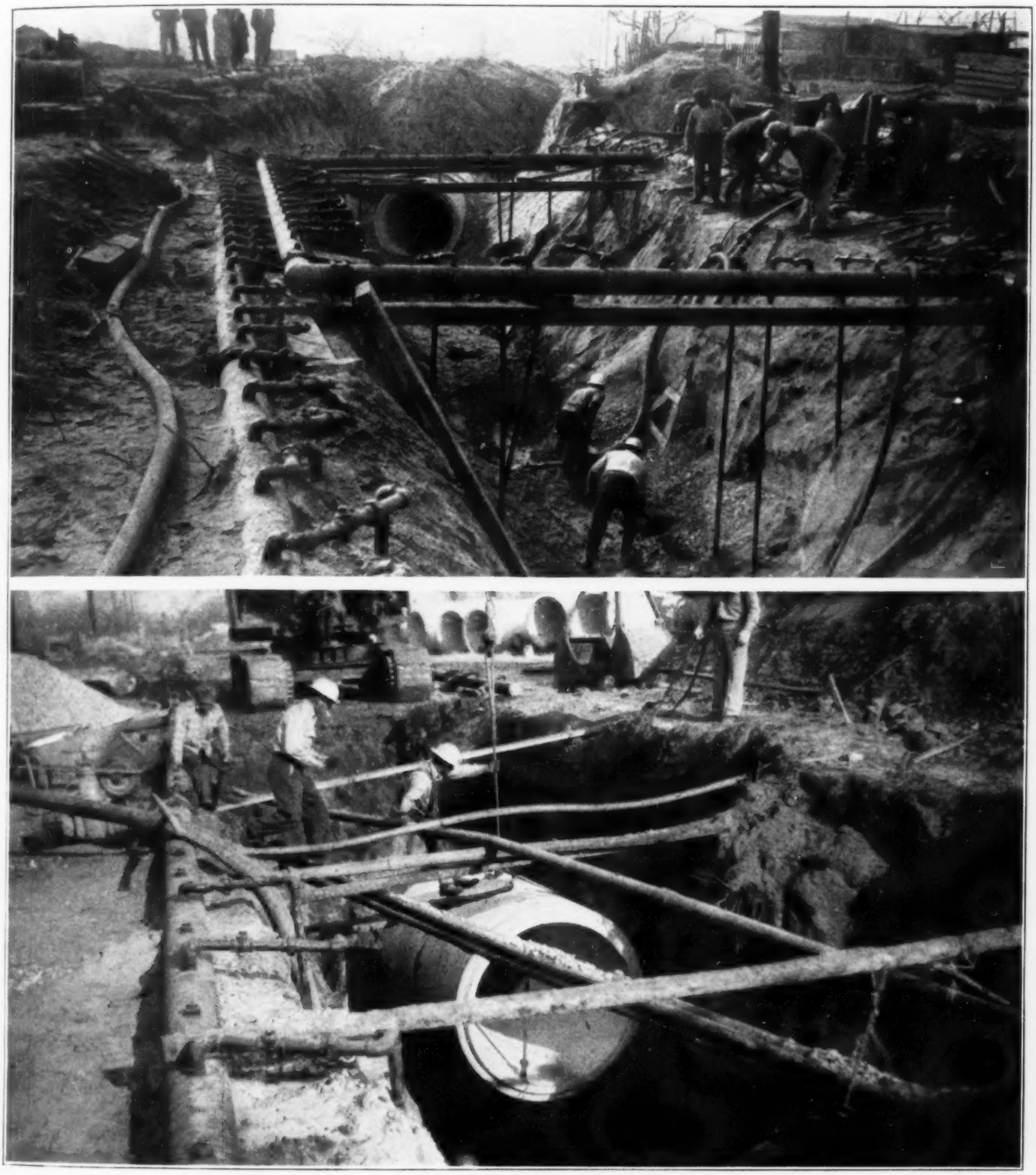
Jetting pipe sunk to position and well point on 2 in. riser being lowered into jetting pipe. Into annular space 4 to 6 ft. of coarse sand is poured and the jetting pipe is then pulled.

ing to the ground surface and standing in surface pools or running across the surface as a stream. In the two "wettest" locations the District undertook construction with its own forces because bidders seemed overcautious in their estimate of anticipated difficulties. The Districts' experience with well-point construction is recorded in this article and in the pictures for the assistance of others who may encounter similar conditions elsewhere.

Make Ready and Job Completed

Upper picture shows how 8 in. suction header and well point assembly is laid out on ground before installation. An essential unit to the job is the crane. Lower picture shows a job completed and ready for pumping.

It is revealed in the pictures that the well points attached to 2 in. riser pipes, installed alongside the proposed trench, are attached by 2 in. pipe connections to an 8 in. suction manifold which is, in turn, connected to the suction side of a 2500 gpm. pump. The pump is operated to draw the ground water surface down to an elevation from which the ground water gradient, normal to the long axis of the trench, will leave the trench free of

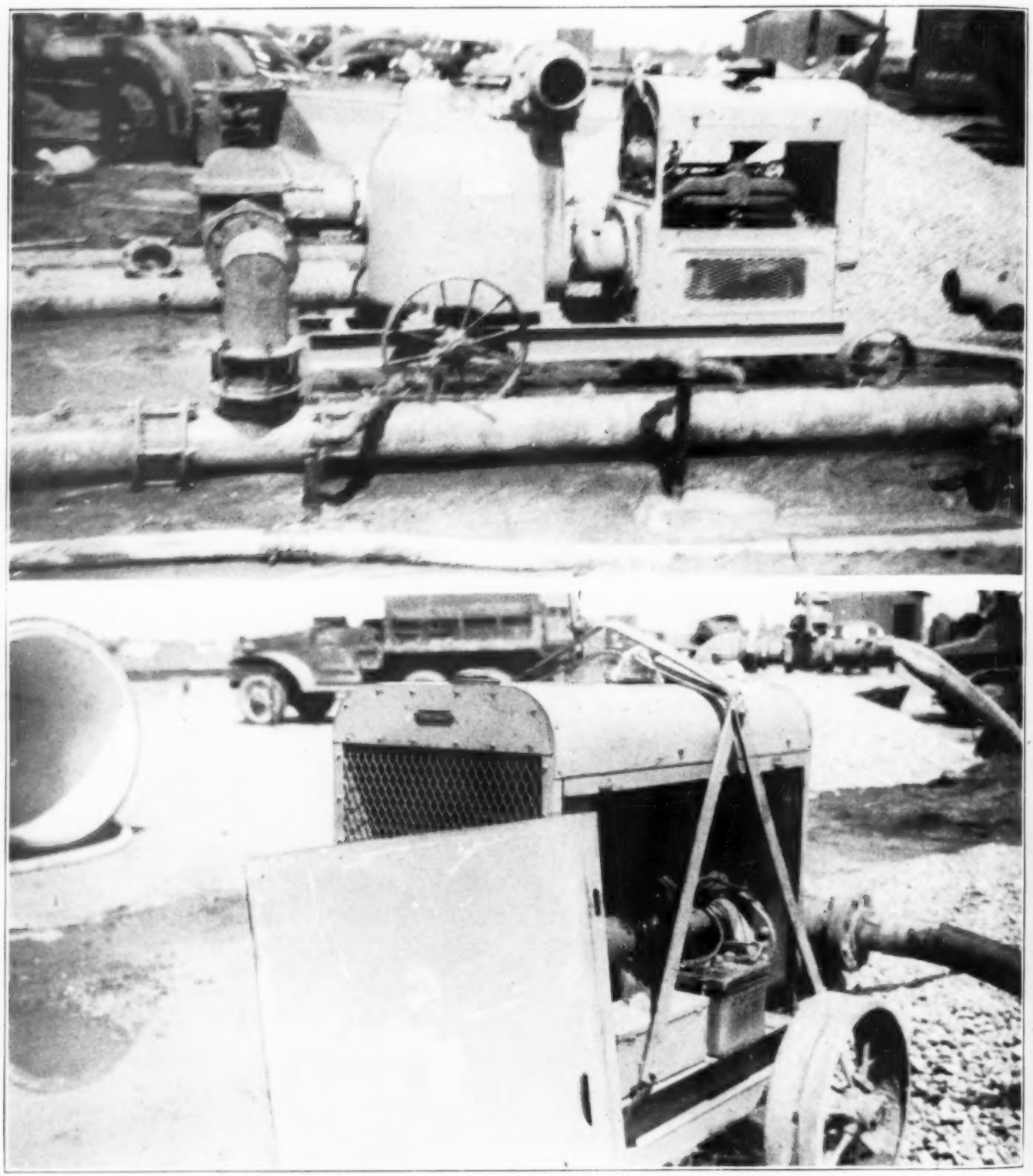


Two Tough Spots

Upper picture is of a location where 150 well points were required to keep 100 ft. of trench dewatered. Here an underground dike was forcing ground water to surface. Lower picture shows location through an oil field where a network of pipe lines was encountered.

water during the process of excavation and pipe installation. The equipment used, the manner of placing the well points, the methods employed, and the results obtained, are shown in the accompanying pictures.

No hard and fast rule for the spacing and location of the points can be stated but, as a general thing, well points spaced at 2 ft. intervals along one side of trench in sandy soil, with the point 5 to 8 feet below trench



Suction and Jet Pumps

In picture above is one of the mobile suction pumps of 2500 gpm. capacity connected to 8 in. suction header. Below is one of the high pressure jetting pumps with discharge of 1500 gpm. at 150 pounds pressure.

A 60-Inch Line in Dry Trench

A 60-inch sewer laid and stabilized effectively in dewatered trench. On right, a string of well points on 8 in. suction header in position and ready for excavation. Note 6 ft. spacing of well points on this particular section.

bottom, will keep the trench dry during construction. Spacing of well points along the suction manifold and proximity to pipe centerline are controlled by soil texture as well as abundance and depth of water. However, the suction manifolds should be equipped so as to space the well points at 2 ft. intervals, if desired.

Well point equipment in use on this job consisted of 1,500 feet of 8 inch spiral welded steel pipe with flanged ends and equipped with 2 in. outlets at 2 ft. intervals; 3 suction pumps; one jet pump; one 6 in. jet pipe and the necessary pressure hose attachment thereto; about 700 well points; an equal number of connections from the well points to the manifold; one tractor crane of about ½ yard capacity; one flat bed truck, and the necessary tools and equipment for coupling the system.

In the construction of 12,750 feet of the pipe line shown in the pictures, all in water bearing sand and loam with the ground water varying from actual ground surface to half depth in the trench, the cost of all labor and materials, equipment rental and all other charges for the well point system was $12,595, or about $1 per foot. Daily progress in pipe laying varied from 50 to 200 feet per day and the trench was held de-watered for three days after backfill.

Water Discharge from Two Systems

Discharge from two systems, each pumping from 80 points spaced at 2 ft. intervals on 8 inch suction header.

NEW HEATING SYSTEM FOR SLUDGE DIGESTION

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RESULTS of test operations have led to the adoption of a new method for sludge heating to be installed at Northeast Treatment Works of Philadelphia. The design of the blower building in which the sludge heating plant is located has been completed and the entire treatment plant is scheduled to go into operation in the fall of 1949.

Ever since sewage treatment plants have been built, the disposal of the resultant sludge has been a problem.

Ordinarily digesters have been heated by placing pipe coils on the inside wall of the tanks and circulating hot water through them. In such heating, the temperature of the heating water is limited to about 135 degrees F. for should this temperature be exceeded, sludge cake forms on the outside of the coils and interferes with transmission of heat. Corrosion also is a major factor in many plants, and emptying a digestion tank for cleaning or repairing the coils or the supporting brackets and putting the tank back into operation is a major undertaking. Heating sludge outside the digesters prevents these troubles and early in the 1930's several installations of this type were made. A pre-heater was installed at Coatesville, Pa., where raw sludge is pumped through tubes in a tank with hot water circulated around the tubes. At Birmingham, England, and at Nuremberg, Germany, supernatant liquor from a digester is passed through a gas fired heater and returned to the digestion tank. During the last few years, a number of installations have been made for heating sludge outside of the digestion tank, either by hot media being passed through tubes surrounded by the sludge or by sludge being passed through tubes surrounded by hot media.

The reason at this time for releasing information on a new heating system at Philadelphia's Northeast Treatment Works is to review an interesting principle which, while novel for sludge digestion, has recently become well established for heat processing of other materials—metals, ceramics, glass chemicals, paper, food products—and has a record of improving process results. These performances remove the new sludge heating system for Northeast Treatment Works from a purely experimental approach.

The Flash Heating Principle

The new arrangement departs from customary methods by providing extremely rapid heat transfer in place of the relatively slow heating ordinarily employed. The full significance, however, of the change to fast heating is not only in speed for its own sake, because speed of heating is the starting point that permits other advantages to be incorporated in the system.

The engineering staff of the Department of Public Works entered into the project with clear conception of results they wanted to obtain. Stated very briefly, it was our idea to maintain ideal digestion temperature irrespective of prevailing weather. We sought a simple, responsive system to operate at full load continuously and economically. With this, we wanted to avoid efficiency losses caused by sludge deposits on conventional heating coils, and also to avoid costly maintenance that accompanies accelerated corrosion. The new system provides the desired features, together with others that will appear in the general description, which it is the purpose of this article to give.

Along with clearly stated aims, as engineers we had an inquiring approach that led us first to reexamine the several heating methods developed and put in use in the past fifty years of the sludge treating art. Our study was based, of course, on the fundamental desirability of hastening sludge digestion by using heat to promote biological activity. Joined with this use of heat, it was considered as equally fundamental that there is value in precise temperature control and agitation in preventing the formation of sludge-cake. In noting the

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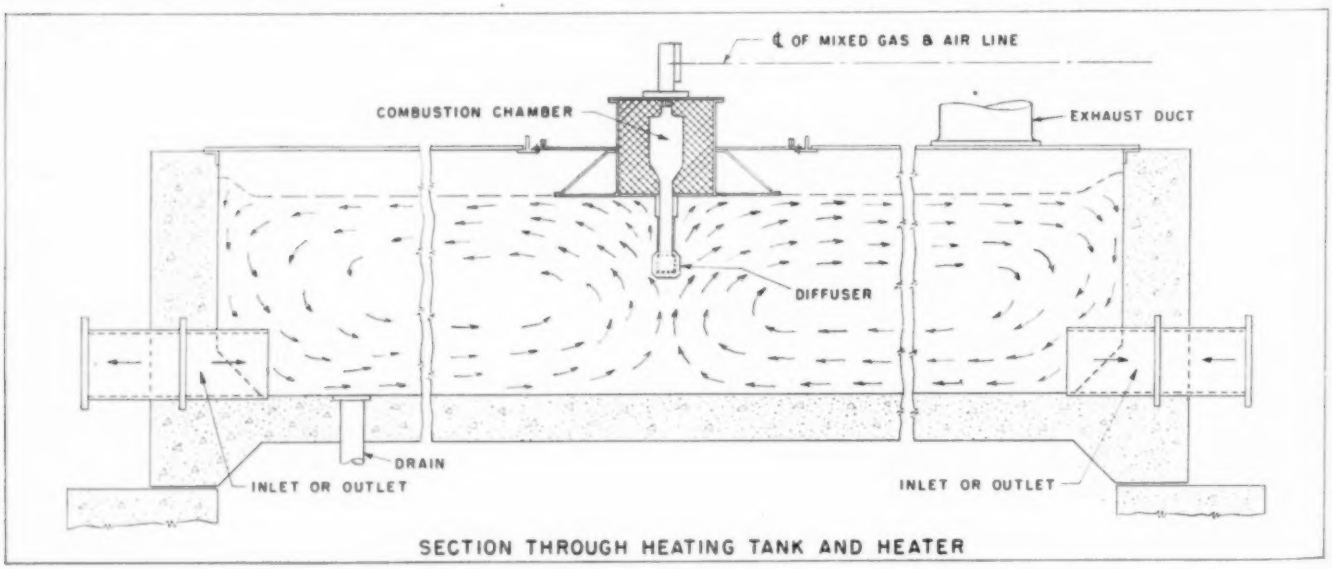

Fig. 1—Section Through Sludge Heating Tank and Gas Burning Heater

prevailing use of coils for heat transfer, we drew the conclusion that when coils are located in separate heating tanks rather than in the digester tanks themselves, the problems of heat control, precipitation and corrosion are lessened but not avoided. We also recognized that these major problems remain in part when coils are arranged to travel the sludge through a bath of heated fluid and when coils are used to conduct heating fluid through a bath of sludge. It was also found that the difficulties of temperature control and corrosion are not eliminated when coil heat is applied only to supernatant liquor rather than to the sludge proper.

As might be judged from these preliminary considerations, our engineering staff began to investigate heating techniques in which indirect heating (through coils or other barriers or walls) is replaced by *direct contact* of flame or combustion products with the body or bath whose temperature is to be raised. The investigation led to consultations with the staff of the Philadelphia Gas Works and thence to the engineering group of Selas Corporation, whose work for the past twenty years has been in pioneering new, direct-heating methods with gas.

Principle Not New

The principle of direct heating of liquids is certainly not new. For some years, flame type burners, (gas or oil fired) have been immersed in fluids to impart heat directly to liquid baths. What is new is the application in the field of sludge heating of high velocity burners capable of releasing heat at rates far beyond those obtainable with any conventional burners whether of immersion-type or not. Conventional combustion methods liberate heat at rates of the order of 200,000 Btu. per hour in a single cubic foot of combustion space, whereas the Selas method (known as "Gradiation") can liberate 45 million Btu. in the same space and time.

The principle of fast heating of sewage sludge leads to a new approach in system design. When heating is accomplished with extreme rapidity, designers of heating systems can devote themselves to the making of ideal arrangements. Questions of control, flexibility and economy do not have to be compromised to allow for sluggish responses in control of temperature. Design of the system can be approached with a free hand for the mechanics of flow and storage.

Effects of Fast Heating

The effect of fast heating on the design of the sludge system for Philadelphia's Northeast Treatment Works, can perhaps best be seen in brief discussion of the accompanying diagrammatic plan of sludge heating equipment (Fig. 2).

From storage tanks the cold sludge is pumped to a flexible heater arrangement in which any tank can be operated by manual valve control as a separate unit, or several tanks can be

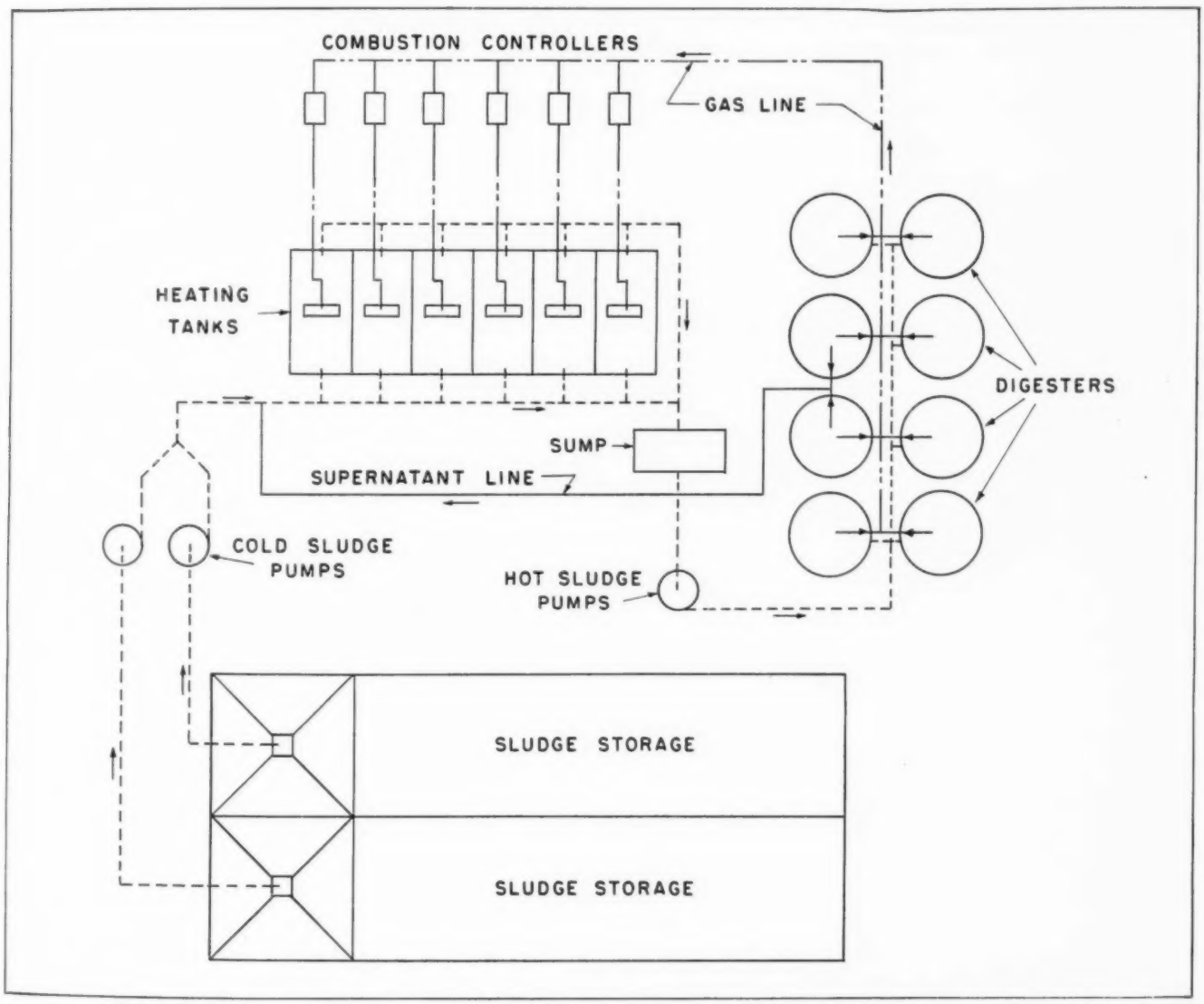

Fig. 2—Diagrammatic Plan of Sludge Heating Units, Sludge Holding Tanks and Digesters

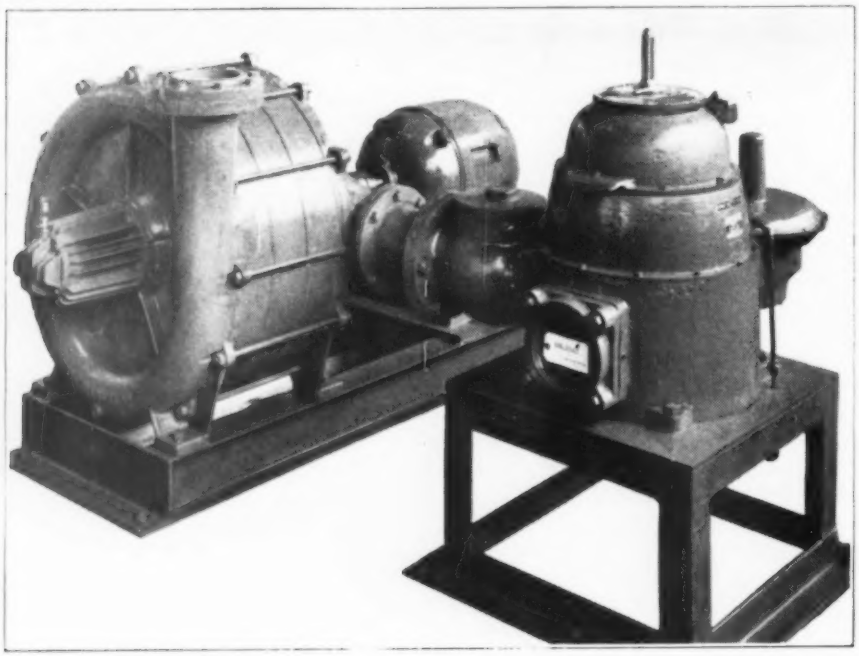

Fig. 3—Selas Turbo Combustion Control Unit

On the right is the combustion mixture valve which maintains an exact gas-air ratio for the burners. The turbo-blower at the left delivers the controlled combustion mixture at proper pressures for high temperature combustion and flash heating, such as is to be employed at the Philadelphia Treatment Plant.

operated in series or in parallel. From the heating station, hot sludge is discharged into a sump. Outgoing flow from the sump to six primary (hot) digesters is so regulated by pump that flow to the digesters is at all times the same as that to and through the heaters. Two secondary digesters are located at right and from them a bypass permits diversion of supernatant liquor to the incoming cold sludge line. This secondary flow of unheated liquor, controlled manually by a butterfly valve, operates to maintain velocity of 3 fps. through system. Incoming sludge volume is 325 gpm.

In operation of the system, heat input is correct at all times to raise sludge temperature to that which offers ideal digestion temperature at any rate of heat loss from total digester surfaces and at any temperature of sludge incoming from storage. On the basis of average winter temperature of 33 degrees F. and sludge temperature of 48 degrees F., heat losses from digesters are calculated at 4,300,000 Btu. per hour. Six million Btu. per hour are required for heating the sludge, totalling 10,300,000 Btu.

Gas supply from the digesters is ample to provide the peak requirement of 19,600 cu. ft. per hour. Of the high-speed burners, each with capacity of 3850 cu. ft. per hour, five will be needed in winter, and only one or two in summer. Six will be installed, one of them a spare.

Functioning of the Heaters

Functioning of the heaters is indicated in the accompanying simplified sketch, Fig. 1. The burner, supported in the steel cover of the concrete tank, projects downward into the sludge. Digester gas, pre-mixed with air in an automatically maintained combustion ratio, enters the combustion chamber *under pressure* from automatic combustion controllers. The combustion chamber is literally a ceramic-lined miniature furnace, capable of reaching and sustaining internal temperatures of 3000 degrees F. or more. Such compressed supercharged gas-air mixture, ignited in the chamber, produces intense heat in the ceramic lining of the combustion chamber. Radiation from the chamber walls heightens the burning reaction, causes high turbulence and expansion of combustion gases which find outlet through ports in the diffuser. It should be emphasized, however, that the heat released from the burner ports is not in the form of flame. The heat is in the form of intense combustion products discharged at high velocities. Area of the ports is so calculated that superheated products of combustion, emerging at temperatures ranging as high as 2400 degrees F. and at speeds up to 30 fps., move into the body of sludge and cause the fluid to be strongly agitated and rapidly circulated. The heat of the gases is absorbed almost instantly. After giving up their heat the gases are withdrawn at temperatures of only 150-180 degrees F. to the exhaust duct and expelled.

From the review of physical arrangements, it is interesting to note the advantages. Valve-control in lines to and from each heating station provides direct control of sludge temperature. Since heat is imparted to sludge without lag, the amount of heat is regulated by simply adjusting the number of heating stations in service at any time. The amount of heat transferred to fluid is not lessened at any period by precipitation and deposit of solids within heating tanks because the agitation and circulation, set up by discharge of combustion gases, keeps all solids in suspension. Nor does precipitation occur in system lines, for the reason that the lines are kept full and velocity is maintained.

Simplicity of operation applies also to the heat-generating apparatus. Each heating tank, equipped with its own pre-mixing or carbureting device (Fig. 3), can be put into action by valve and starting switch. Carburetor and compressor design involves no departure from literally thousands of pre-mixers and positive compressors with years of trouble-free service behind them.

The prospect of extremely low maintenance charges holds for the entire system. The absence of thickened sludge, except in digester tanks, promises that outages of heating stations can be scheduled for inspection rather than for cleaning. Stainless steel has been used for those metal portions of the burners and heating tank which come in contact with the corrosive fluid. Heater tank walls are of concrete.

The ceramic elements in the burner structure are very durable. They were developed by Selas Corporation for use in "Gradiation" heating and are capable of withstanding high temperatures of the order of 3100 degrees F. and gas velocities that approach those of jet-engines. Actually burner-chamber temperature in the installation at Northeast Treatment Works will be 2400 degrees F. and gas velocities, while more than ample to supply thorough agitation and circulation, will be well below the maximum for which the ceramic elements were made.

Design and development of the new sludge heating system resulted from collaboration of Messrs. F. O. Hess and A. A. Furczyk, for Selas Corporation with Messrs. E. R. Schofield and M. B. Tark, for the City of Philadelphia. The project is under the supervision of Mr. A. Z. Hoffman, Chief Engineer and Surveyor and Mr. Thomas Buckley, Director.

AMPEROMETRIC TITRATION OF RESIDUAL CHLORINE IN SEWAGE

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THE usual methods for determining chlorine residuals in sewage are known to have many shortcomings. The orthotolidine test, the starch-iodide method, etc., do not give values of residual chlorine that correlate well with bacterial counts, it being commonly recognized that bacterial reduction can be obtained when these tests indicate zero residual. The amperometric titration as applied by Marks and Glass[1] to water is likewise not applicable to sewage. In the amperometric method as applied to chloramine residuals ("bound" chlorine) of the type usually obtained in sewage, potassium iodide is added and the free iodine released titrated amperometrically with standard arsenite at neutral pH. In sewage, however, the liberated iodine quickly reacts with mild reducing agents which were unaffected by the chloramine. Before the titration with arsenite can be carried out the reaction has proceeded so far that very little active halogen is left, and the test therefore is not useful in this application.

A New Approach

The purpose of the present work was to modify the amperometric method to avoid this loss of active halogen. Before adding iodide the sample is treated with a measured excess of titration reagent and the liberated iodine reacts so rapidly with this reagent that none is lost in extraneous reactions. The excess reagent remaining is then back-titrated with standard iodine. If this back-titration were carried out in the neutral pH range an approximate end-point only would be possible because each increment of iodine reacts to some extent with the sewage constituents. The deflection of the galvanometer needle indicating the end-point is quite temporary. After the trace of free iodine reacts with constituents of the sewage the needle returns to its initial position. In a highly concentrated sewage it may not be possible to arrive at even a good approximation.

The rate of reaction between iodine and the sewage constituents, however, decreases with a decrease in pH. Below pH 2.5 a trace of free iodine can persist in the sewage sample for a sufficiently long time to give a permanent end-point. Decreasing the pH does not alter the condition of the residual in the sample because the pH is lowered only after the residual chlorine has reacted with the titrating reagent. The actual reaction between the chlorine and the reagent has been shown by experiments on dilute sewage (in which the whole procedure was carried out without lowering the pH) to go practically to completion at the original pH of the sewage. It was obvious therefore, that if the pH is lowered to less than 2.5 after the residual chlorine has reacted with the titrating agent, the back titration can be carried out with a permanent end-point.

For this titration at low pH, a new reagent had to be found because sodium arsenite does not reduce iodine below pH 6.0. The titration of organic arsenoxides with iodine at low pH having been described by other investigators[2], it was concluded that some member of this class might be applicable to the present method. Phenylarseneoxide reacts quantitatively with iodine even at pH values below 2.5 and was found to be a very satisfactory substitute for arsenite in the back titration.

This technic of back titration differs from the original procedure of Marks and Glass[1] in regard to the end-point. In that procedure, each increment of titrating reagent produced a decrease in active halogen concentration and consequently in galvanometer reading as long as active halogen was present. At the end-point addition of reagent produced no galvanometer change. In the new procedure, each increment of titrating reagent (iodine) produces a decrease in the amount of excess phenylarseneoxide present. The instrument is not sensitive to phenylarseneoxide and the galvanometer reading does not change during the addition of iodine but when phenylarseneoxide is completely oxidized, the next addition of iodine causes a galvanometer deflection indicating the end-point.

Procedure

To a 200 ml. sample is added 5 ml. of 0.00564 *N* phenylarseneoxide solution containing 7.5 grams per liter of potassium iodide. After thorough mixing, the sample is treated with 2 ml. of *N* hydrochloric acid. The unreacted phenylarseneoxide is titrated with 0.0282 *N* iodine solution from a 1 ml. burette using an amperometric titrator as described by Marks and Glass[1] or Marks and Bannister[3]. As the titration proceeds the needle should remain stationary until the end-point is approached. Just before this point each increment of iodine reagent causes a deflection which is only temporary, the needle immediately returning to its original position. At the end-point the deflection is permanent and unmistakable.

Preparation of Reagents

The 0.00564 *N* phenylarseneoxide solution is prepared by first dissolving approximately 0.8 g. of the compound in 150 ml. of 0.3 *N* NaOH. This solution is unstable and should be used immediately by adding 110 ml. of it to 800 ml. of distilled water containing 7.5 g. of KI and thoroughly mixing. This solution is brought to a pH between 6 and 7 with dilute HCl and finally diluted to one liter. A 50 ml. sample is titrated with freshly standardized 0.0282 *N* iodine using starch indicator. Sufficient distilled water is then added to the remaining solution to bring it to exactly 0.00564 *N* and this standardization is then re-checked against the iodine solution.

To prepare the 0.0282 *N* iodine solution add to a one liter volumetric flask 25 g. of KI in a little water, the proper amount of an approximately 0.1 *N* iodine solution that has been exactly standardized and dilute to one liter. The standardization is then checked against Bureau of Standards arsenious oxide by the method supplied with the certificate. The 0.1 *N* iodine solution is prepared by dissolving 40 g. of KI in 25 ml. distilled water and then adding 13 g. of resublimed iodine and stirring until dissolved. This solution is transferred to a one liter volumetric flask and diluted to one liter. It is standardized in the same manner as the 0.0282 *N* iodine.

Since each ml. of 0.0282 *N* iodine solution is equivalent to 5 ml. of phenylarseneoxide solution and each ml. of the latter consumed by the 200

Table I

CHLORINE RESIDUALS AND BACTERIAL COUNTS ON EFFLUENT SAMPLES

Sample	Chlorine Dose (ppm.)	Contact Time (Min.)	Chlorine Residual (ppm.) OT	Amper.	Bact. per ml. 37° C. MPN Coliform	EMB	Agar
1	0	....	.....	.....	540,000	420,000	310,000
1	1.5	15	0.02	1.10	130	400	104,000
1	1.5	30	0.00	.....	.....	60	500
1	1.5	60	0.00	0.80	.....	45	560
1	4.0	15	0.60	3.05	23	5	16
1	4.0	60	0.25	2.40	.....	55	114
2	0	....	.....	.....	350,000	119,000	440,000
2	2.5	15	0.00	0.95	920	1,480	8,500
2	2.5	60	0.00	0.35	.....	330	10,900
2	5.0	15	0.75	3.40	130	22	2,200
2	5.0	60	0.60	2.80	.....	6	160
3	0	....	.....	.....	540,000	710,000	700,000
3	1.75	15	0.00	0.80	1,600	7,200	14,000
3	5.75	15	0.90	4.00	17	2	105
4	0	....	.....	.....	350,000	216,000	280,000
4	1.75	15	0.50	1.15	110	13	270
4	1.75	60	0.40	0.90	.....	14	16
5	0	....	.....	.....	170,000	288,000	237,000
5	1.30	15	0.00	0.75	490	860	3,300
5	1.30	60	0.00	0.40	.....	97	630
5	3.5	15	0.35	2.55	130	223	4,500
5	3.5	60	0.18	2.30	.....	4	25
6	0	....	.....	.....	540,000	250,000	330,000
6	2.75	15	0.30	1.70	33	25	860
7	0	....	.....	.....	540,000	260,000	560,000
7	4.00	15	0.00	1.00	920	2,500	76,000
7	4.00	60	0.00	0.20	.....	125	2,600
7	7.75	15	0.50	5.15	70	11	2,000
8	0	....	.....	.....	540,000	142,000	210,000
8	2.25	15	0.40	1.05	13	112	100
9	0	....	.....	.....	350,000	366,000	660,099
9	3.75	15	0.00	2.20	110	95	540
9	3.75	60	0.00	1.20	.....	34	20
9	5.50	15	0.18	4.05	130	12	95

ml. sample represents 1 ppm. available chlorine, the following formula holds:

Chlorine Residual (ppm.) = (5 − 5 × no. (ml. 0.0282N I_2 soln.).

The phenylarseneoxide solution made in this way has been found to retain its standardization indefinitely. The iodine solution, if protected from light, loses strength at the rate of about 1 per cent in two months.

EXPERIMENTAL DATA

Five gallon grab samples of both raw sewage and effluent were collected from each of nine treatment plants in northern New Jersey. Each sample was quickly transported to the laboratory and put on ice until ready for test. Just before the test proper the sample was inoculated with a 24 hour broth culture of *E. coli* in the amount found to be necessary to bring the coliform bacteria count up to 200,000 to 500,000 per ml. After removing the control sample the sewage was divided into several portions, which were treated with different amounts of neutral sodium hypochlorite solution.

At various time intervals samples were removed from each portion. Chlorine residual was determined by the new amperometric procedure, the OT test, and the *p*-aminodimethyl aniline test. Both colorimetric tests were done in a turbidity compensated colorimeter. OT colors were compared with permanent glass standards, reading maximum color and using sufficient reagent to give the proper pH[4]. The *p*-aminodimethyl aniline test was done substantially according to the procedure of Palin[5]. Bacteria counts on nutrient agar at 20°C. and at 37°C. and on EMB agar at 37°C. were done. On one sample from each portion the most probable number (M.P.N.) of coliform bacteria was determined. In the data tables the 20°C. counts are omitted because they closely parallel the other counts.

Tables I and II show the relation between bacteria count, chlorine residuals by OT and chlorine residuals by amperometric titration for effluent samples and for raw sewage samples respectively.

Table III shows the comparison between the three methods of determining residual for a number of representative cases of both effluent and raw sewage. To determine whether the same relations between the different tests existed over a range of pH, three portions each of a raw sewage and of an effluent were adjusted to pH values of 5, 7 and 10 and treated with chlorine. The same differences between the three methods were observed.

Tables I and II show that the OT method and the amperometric method give results differing to an extent which varies widely from sample to sample of either raw sewage or effluent. In the largest single variation the OT method gave a residual of 0.5 ppm., the amperometric method a residual of 5.65 ppm. The difference between the results of these two tests shows a fairly consistent increase as the chlorine dose increases. Within the range of chlorine demand in these tests there is no apparent correlation between the chlorine demand and the difference between the results obtained by these methods. That there is an overall relation is shown by the extreme case of water with low demand, where the OT method and the amperometric method give identical results within experimental error.

Comparison of the amperometric titration with the *p*-aminodimethyl aniline indicator in Table III shows good agreement. All readings are not included, but the ones given are representative of the amount of variation encountered. Exact agreement could not be expected since the experimental error in the *p*-aminodimethyl aniline method is comparatively large under the present technic. Rapid fading occurred and in many samples the colors obtained did not match the

Table II

CHLORINE RESIDUALS AND BACTERIAL COUNTS ON RAW SEWAGE

Sample	Chlorine Dose (ppm.)	Contact Time (Min.)	Chlorine Residue (ppm.) OT	Amper.	Bact. per ml. 37° C. MPN Coliform	EMB	Agar
1	0	....	.....	.....	920,000	480,000	430,000
1	1.75	15	0.06	1.30	.....	690	32,000
1	1.75	120	0.00	0.35	140	170	2,300
1	4.50	15	0.60	3.50	.....	28	39
1	4.50	120	0.12	1.60	23	15	86
2	0	....	.....	.....	540,000	183,000	510,000
2	2.75	15	0.10	1.60	.....	280	9,000
2	2.75	120	0.00	0.35	79	330	2,300
3	0	....	.....	.....	540,000	610,000	707,000
3	3.00	15	0.00	0.90	.....	270	1,000
3	3.00	120	0.00	0.00	330	179	3,600
4	0	....	.....	.....	920,000	346,000	420,000
4	3.25	15	0.00	1.60	.....	2,000	17,000
4	3.25	120	0.00	0.60	350	1,100	2,700
4	6.00	15	0.80	4.50	.....	1,400	1,500
4	6.00	120	0.05	1.90	33	380	220
5	0	....	.....	.....	350,000	312,000	270,000
5	3.75	15	0.00	1.95	.....	81	1,200
5	3.75	120	0.00	1.05	33	9	330
5	7.00	15	0.30	4.15	.....	58	200
5	7.00	120	0.02	1.70	5	3	75
6	0	....	.....	.....	540,000	402,000	510,000
6	2.75	15	0.00	0.75	.....	2,100	21,000
6	5.75	15	0.40	3.20	.....	99	720
6	5.75	120	0.08	1.70	49	80	150
7	0	....	.....	.....	1,600,000	420,000	800,000
7	6.5	15	0.00	2.80	.....	33	260
7	6.5	120	0.00	0.20	1,300	45	1,500
7	10.0	15	0.50	6.15	.....	23	1,600
7	10.0	120	0.00	2.10	79	13	104
8	0	....	.....	.....	540,000	250,000	270,000
8	2.0	15	0.00	0.45	.....	22	340
8	4.75	15	0.40	2.50	.....	3	30
8	4.75	120	0.12	1.05	8	6	55
9	0	....	.....	.....	540,000	320,000	990,000
9	3.75	15	0.00	1.30	.....	11,000	118,000
9	3.75	120	0.00	0.05	190	210	2,000
9	7.00	15	0.60	3.95	.....	11	34
9	7.00	120	0.00	1.50	33	9	49

Table III
CHLORINE RESIDUALS BY THREE METHODS
Contact Time in each case—60 Minutes

Source of Sewage	Chlorine Dose (ppm.)	Chlorine Residual (ppm.) OT	P-Amino Dimeth. An.	Amper.
1—Effluent	1.0	0.00	0.3	0.35
1—Effluent	4.0	0.25	2.2	2.40
1—Raw	1.75	0.00	0.4	0.95
1—Raw	4.5	0.30	2.2	2.50
2—Effluent	2.5	0.00	0.4	0.35
2—Raw	2.75	0.00	1.1	0.70
3—Effluent	5.75	0.50	3.1	3.00
3—Raw	5.25	0.35	2.5	2.20
4—Effluent	1.75	0.40	1.4	0.90
4—Raw	6.0	0.12	4.2	3.25
5—Effluent	3.5	0.18	2.0	2.30
5—Raw	3.75	0.00	0.8	1.25
6—Effluent	3.75	0.50	3.1	2.15
6—Raw	5.75	0.18	2.0	2.20
7—Effluent	7.75	0.10	2.8	3.40
7—Raw	6.5	0.00	0.8	1.10
8—Effluent	3.25	0.65	2.5	1.60
8—Raw	4.75	0.30	2.0	1.80
9—Effluent	2.0	0.00	0.8	0.25
9—Raw	7.0	0.40	2.0	2.25

standards even though the method compensated for the color of the sewage.

The bacteriological results agree better with the amperometric titration and with *p*-aminodimethyl aniline than with the OT values. There are numerous cases in Tables I and II where the OT method showed zero residual in spite of fairly rapid sterilization while the amperometric method showed a residual. Although the data are not tabulated because of space limitations in all instances but one (in Table I) where the orthotolidine test showed no residual after fifteen minutes contact, it had shown no residual after only one minute contact. The exception is .07 ppm. after one minute for sample No. 3 (chlorine dose: 1.75 ppm.). In Table II there are three exceptions of this nature. Sample No. 7 (6.5 ppm. dose), sample No. 8 (2 ppm. dose) and sample No. 9 (3.75 ppm. dose) each showed a residual of .08 ppm. by OT after one minute contact.

There remain quite a few cases where a large reduction in the bacterial population was observed with zero OT residual at one minute. The residual obtained by the amperometric method or the *p*-aminodimethyl aniline method appears to be more nearly the true residual. These results may help clarify previous observations that the bacterial count could be reduced by chlorine doses insufficient to give a residual with orthotolidine[6] or with starch-iodide[7, 8]. The amperometric titration probably includes N-chloro compounds as discussed by Rudolfs and Ziemba[7] not detectable by the other methods. While bacterial kill is not proportional to per cent of chlorine demand satisfied[8, 9], it increases as the demand increases if the same percentage of demand is satisfied in each case[8]. The greater apparent demand in terms of OT or starch-iodide could mean greater concentrations of N-chloro compounds formed on chlorination and therefore greater kill.

Application to Consecutive Samples from One Plant

It was thought that a series of samples from the same plant would show a more constant difference between the amperometric and OT methods than grab samples from many plants. In each of two treatment plants samples of unchlorinated effluent were taken throughout one day, treated with chlorine and the residuals determined by both the OT and the amperometric methods after fifteen and again after sixty minutes' contact. Each sample was divided into two parts, one being treated with a predetermined chlorine dose that was used throughout the day and the other with that chlorine dose required to give a residual of about 0.5 ppm. by OT after fifteen minutes as shown by a preliminary experiment.

The results obtained on the two plants are shown in Tables IV and V. While there is more regularity here than in the previous tests, the relation between the results obtained by the two methods is by no means constant. Frequently the two methods show the residual changing in opposite directions, on taking consecutive samples one hour apart and treating with the same dose. The quality of the effluent changes sufficiently to cause the OT method to give a different fraction of the total residual at different times.

There are two obvious causes for the failure of the OT method to indicate the whole chlorine residual. The residuals being chloramine residuals, and probably organic chloramines at that,[7] the color forming reaction with orthotolidine is very low. In many such cases the full OT color is never reached under ordinary conditions. The maximum color observed is probably that which can be reached before the fading becomes predominant. This may be very much less than if fading did not occur.

A second possible cause is the acidification of the sample in making the OT test. Lowering the pH makes chloramines more reactive so that a large fraction of the chlorine residual may react with the sewage constituents rather than with the orthotolidine. Further experiments to obtain information on the nature of these reactions will be reported later.

Table IV
COMPARISON OF TWO METHODS ON CONSECUTIVE SAMPLES FROM PLANT A

Time Sample Taken	Chlorine Dose (ppm.)	Chlorine Residual (ppm.) 15 Min. Contact OT	15 Min. Contact Amper.	60 Min. Contact OT	60 Min. Contact Amper.
11:06 AM	10.0	0.50	7.4	0.15	4.4
12:05 PM	10.0	1.00	5.5	0.40	4.35
"	9.0	0.75	4.6	0.60	4.35
1:10 PM	10.0	1.00	6.2	0.50	4.5
2:30 PM	10.0	1.00	5.5	0.75	3.6
"	8.5	0.75	5.2	0.50	1.65
3:00 PM	10.0	1.50	5.9	1.00	4.5
"	8.0	0.60	5.75	0.50	3.05

Other Titration Methods

The rapid reaction of free iodine at neutral pH even with sewage that had been chlorinated to a residual makes the neutral starch-iodide meth-

Table V
COMPARISON OF TWO METHODS ON CONSECUTIVE SAMPLES FROM PLANT B

Time Sample Taken	Chlorine Dose (ppm.)	Chlorine Residual (ppm.) 15 Min. Contact OT	15 Min. Contact Amper.	60 Min. Contact OT	60 Min. Contact Amper.
12:25 PM	4	0.40	3.25	0.30	1.75
1:05 PM	4	0.75	2.50	0.60	1.75
"	3	0.50	1.85	0.40	1.65
2:35 PM	4	0.80	2.60	0.75	2.00
"	3	0.50	2.00	0.40	1.50
3:30 PM	4	0.75	2.25	.....	.....
"	3.5	0.50	1.70	.....	.....

od less promising than the acid method. The latter method, however, gives very erratic results. In some samples the residual found is greater than the amount of chlorine added. In others, the result is much lower than that obtained amperometrically, being hardly greater than the OT result. Turbidity and color in the samples make the end-point very uncertain. The release of all the iodine at once into the sewage is also an unfavorable situation.

A more promising alternate method is a modification of the one presented wherein the appearance of the starch-iodide color is substituted for the amperometric end-point in the back-titration with standard iodine. Other than the addition of starch solution exactly the same procedure is used including acidification and therefore use of phenylarseneoxide instead of arsenite. The results were quite satisfactory when good mechanical agitation was used for the iodine titration and when the first appearance of the blue color under good light was taken as the end-point. Table VI contains a representative series of determinations. Apparently a larger amount of iodine is necessary to give a visible starch color in the sewage than to reach the amperometric end-point. This causes the colorimetric method to give somewhat lower residuals than the other.

Table VI

Comparison Between Colorimetric and Amperometric End-Points

Sample No.	Chlorine Dose (ppm.)	Contact Time (Min.)	Chlorine Residual (ppm.) OT Method	Amper. Titration	Color. Titration
1	1.0	30	0.0	0.43	0.28
1	1.0	60	0.0	0.18	0.03
2	4.5	30	0.60	2.28	2.03
2	4.5	60	0.60	1.78	1.63
2	4.5	120	0.40	1.38	1.13
3	1.5	30	0.0	0.33	0.03
4	3.5	30	0.25	1.48	1.23
4	3.5	60	0.15	1.13	0.93
4	3.5	120	0.08	0.63	0.43

Conclusions

Chlorinated sewage apparently contains chlorine compounds which are not included to any great extent in the values obtained by the usual methods of determining residual chlorine. This fraction of the residual is included in the result obtained using *p*-aminodimethyl aniline with iodide or more consistently by using the amperometric titration procedure given above. This fraction should not be neglected since it does exert considerable action against micro-organisms. A means of measuring this residual should be particularly important wherever it is desired to chlorinate to satisfy only a fraction of the usual demand, such as for the prevention of septicity[10]. For this and similar purposes this convenient method of control by determining residual chlorine amperometrically, may make it feasible to obtain a desired result with chlorination rates that are more economically feasible.

We wish to acknowledge the technical assistance of Donn H. Horchler, Malcolm Cornish and Elaine Herrigel of these laboratories.

References

1. Marks, Henry C. and Glass, J. R. A New Method of Determining Residual Chlorine. *J. Am. Water Works Assoc.* **34** 1227 (1942).
2. Banks, C. K., and Sultzaberger, J. A. A Quantitative Method for the Estimation of the Arsenoso Group. *J. Am. Chem. Soc.* **69** 1 (1947).
3. Marks, Henry C., and Bannister, L. G. Amperometric Methods in the Control of Water Chlorination. *Analytical Chem.* **19** 200 (1947).
4. "Standard Methods for the Examination of Water and Sewage." American Public Health Association, New York, 9th Edition (1946).
5. Palin, A. T. Determination of Free Chlorine and of Chloramine in Water with p-aminodimethylaniline. *Analyst* **70** 203 (1945).
6. Lea, C. Chemical Control of Sewage Chlorination. *J. Soc. Chem. Ind.* **52** 245 T (1933).
7. Rudolfs, Willem, and Ziemba, J. V. The Efficiency of Chlorine in Sewage Disinfection as Affected by Certain Environmental Factors. *J. Bact.* **27** 419 (1934).
8. Rudolfs, Willem; Ziemba, John, and Gehm, H. W. Effect of Chlorine Dosage Upon the Percentage Reduction of Escherichia Coli. *Sewage Works J.* **6** 1094 (1934).
9. Symons, Geo. E., and Simpson, R. W. Disinfection of Sewage by Chlorination. *Sewage Works J.* **13** 1149 (1941).
10. Haworth, J. Chlorination of Sewage for Prevention of Septicity. *J. Soc. Chem. Ind.* **52** 293 T (1933).

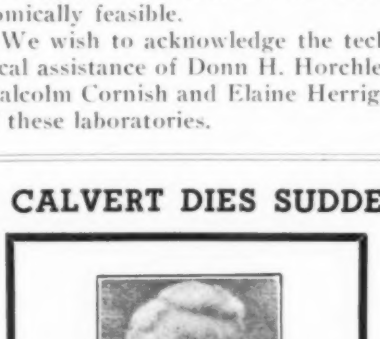
C. K. CALVERT DIES SUDDENLY

Cecil K. Calvert, Supt. of Purification, Indianapolis Water Co., Indianapolis, Ind., died suddenly on April 19.

A graduate of Earlham College in 1908, Calvert was chemist for the Indianapolis Water Co. until 1921. He then served as director of experimental work for the Indianapolis Sanitary District until 1924 when he became superintendent of the sewage treatment works of that city, a position he held until 1936, at which time he succeeded Harry Jordan as superintendent of purification of the Indianapolis Water Co.

A tireless worker in the field of water supply and sanitary engineering, Calvert was a member of A.W.W.A., Central States S.W.A. (Pres. 1933), A.C.S. (Chairman Ind. Section 1927-28), A.S.C.E., A.S.B. (Chairman Ind. Branch 1934-35), A.P.H.A., National Soc. P.E., and other organizations.

Mr. Calvert was also a member of the Indiana Stream Pollution Control Board, Ohio River Valley Water Sanitation Compact Commission, the Indiana Public Health Advisory Council, and the Sanitary Engineering Research Advisory Board of Purdue University.



In the American Water Works Association, Calvert was most active.

At the time of his death he was chairman and editor of the Specifications for Water Purification Chemicals, a redraft of the intended final form of Specifications being in circulation among officers of the Water Purification Div. at the present time. Calvert was also a collaborator in the revision of the Manual of Water Quality and Treatment and co-chairman of the Committee on Specifications for Laying Cast Iron Pipe, which committee issued a procedure for disinfecting water mains which ran in the February issue of the *J.A.W.W.A.* Calvert was also a member of the Committee on Water Works Practice, Publication Committee, Committee on Distribution System Safety, Committee on Biological & Chemical Problems of Water Treatment; a member of the Goodell Prize Committee in 1943, chairman in 1944; chairman of the Committee on Control of Chlorination in 1942-43; member of the Committee on Chlorine Ammonia Treatment in 1941; and received the Fuller Award in 1943.

The passing of Cecil K. Calvert will be a loss not only to the company for which he worked, but to the profession at large, particularly to the A.W.W.A. and the Indiana Section.

UTILIZATION OF CHLORINE DURING SEPTICIZATION OF SEWAGE*

by
H. HEUKELEKIAN
Associate, Department of Sanitation
RUTGERS UNIVERSITY
NEW BRUNSWICK, N. J.

HYDROGEN sulfide is the main source of odors derived from sewage. It arises from the reduction of sulfates by certain bacteria under anaerobic conditions. Chlorine is widely used as a means of control of such odors. As a preventive measure, it is generally added to sewage before sulfides are produced and acts by retarding the septic action. Under these conditions relatively small doses of chlorine are sufficient. Seldom is it necessary to obtain a residual chlorine to delay the action. Experimental work reported previously[1] has shown that chlorine dosage as low as 20-25 per cent of the full chlorine demand is sufficient to delay sulfide production.

When sewage becomes septic before chlorine is applied, it is to be expected that a greater dosage will be required to destroy the odors produced, because the chlorine demand of septic sewage is higher than that of fresh sewage. The effectiveness of the chlorine when applied as a remedial measure depends on the reaction between the chlorine added and the hydrogen sulfide present. If there were no other substances in sewage reacting with the chlorine other than hydrogen sulfide, then a dosage of chlorine sufficient to react with the sulfide would be necessary.

Inasmuch as the concentration of hydrogen sulfide seldom reaches more than a few parts per million in a sewage which is considered septic and objectionable, the dosage of chlorine should not be high, if it reacted only with the sulfides. Even a fresh sewage, however, has a relatively high chlorine demand, and this demand increases as the sewage becomes septic. It is reasonable, therefore, to conclude that chlorine consumption by hydrogen sulfide represents only a part of the total demand. By measuring the quantity of sulfide destroyed by a given dosage of chlorine, it should be possible to determine the quantity of substances other than sulfides reacting with chlorine and to measure the relative percentage of chlorine consumed by sulfides as against that reacting with other substances during the septicization of sewage. This represents the theoretical aspect of the purpose of the paper. On a practical level, it is the intention of the paper to show the dosage of chlorine required when used as a remedial measure to destroy the sulfides in septic sewage.

The Author

Experimental Studies

A number of bottles were filled completely with fresh sewage, tightly stoppered, and, incubated at 20° C., and at intervals one bottle was used for the determination of the chlorine demand, hydrogen sulfide and fixed sulfides.

Various portions of the sewage were then chlorinated to obtain the following percentages of the chlorine demand: 25, 50, 75, and 100. The residual hydrogen sulfide and fixed sulfides were then determined.

Results

The results obtained on the chlorine demand of the sewage and the quantity of sulfides during the incubation period are given in Table I. From the quantities of total sulfides found, the chlorine equivalents were calculated. These equivalents, in turn, are presented as the percentages of the total demand. The differences between the chlorine equivalent of the total sulfides and the total chlorine demand are presented as ppm., and also as percentages of the chlorine demand not accounted for by sulfides.

The results show that the chlorine demand of the sewage increased rapidly during the first ten days. During this period the hydrogen sulfide content increased simultaneously, while the fixed sulfides remained at a low level. In the fresh sewage the total sulfides constituted only 6 per cent of the chlorine demand, and other reducing substances amounted to 94 per cent of the chlorine demand. As the sewage became septic, between 22 and 27 per cent of the chlorine demand was due to sulfides and 73 to 78 per cent to other reducing substances. The quantity of substances other than sulfides reacting with chlorine was higher than that of the sulfides.

Table I
CHLORINE DEMAND, SULFIDES, AND CHLORINE EQUIVALENT OF SULFIDES IN SEWAGE UNDER SEPTIC ACTION

Days	Chlorine Demand ppm.	H_2S as S ppm.	Fixed Sulfides as S ppm.	Chlorine Equivalent of Total Sulfides		Cl_2 Demand Not Accounted for By Sulfides	
				ppm.	%	ppm.	%
Initial	17.0	0	0.5	1.1	6.0	15.9	94
4	64.5	7.0	1.0	17.6	27.0	46.4	73
7	102.0	8.8	1.4	22.4	22.0	79.6	78
10	116.0	11.6	1.3	28.4	24.0	87.6	76
14	114.0	12.2	1.0	29.0	25.0	85.0	75

The effectiveness of the addition of various dosages of chlorine, represented as percentage of the chlorine demand, in destroying the hydrogen sulfide and fixed sulfides in sewage which had previously undergone septic action is shown in Table II. It can be seen that only when 100 per cent of the chlorine demand is satisfied, are the sulfides completely eliminated. Chlorination to 75 per cent of the demand left only traces of sulfides, but 50 and 25 per cent chlorination proved inadequate to remove the sulfides from sewage once it has become septic.

The total sulfides eliminated by chlorine treatment were converted

*Journal Series Paper of the New Jersey Agricultural Experiment Station, Department of Sanitation, Rutgers University, New Brunswick, New Jersey. Presented before the American Chemical Society, April, 1946, and released for publication in *Water & Sewage Works*.

Table II

ELIMINATION OF HYDROGEN SULFIDE BY VARIOUS DOSAGES OF CHLORINE EXPRESSED AS PER CENT OF THE DEMAND

	Per Cent of Chlorine Demand Satisfied									
	100%		75%		50%		25%		0%	
Days	H_2S as S ppm.	Fixed Sulf. as S ppm.	H_2S as S ppm.	Fixed Sulf. as S ppm.	H_2S as S ppm.	Fixed Sulf. as S ppm.	H_2S as S ppm.	Fixed Sulf. as S ppm.	H_2S as S ppm.	Fixed Sulf. as S ppm.
Initial	..	..	..	..	..	..	..	..	0	.5
4	0	0	0.3	0.3	2.1	0.8	4.2	1.0	7.0	1.0
7	0.1	0	0.4	0.7	3.2	1.0	5.4	1.0	8.8	1.4
10	0	0	0.8	0.7	4.6	1.0	7.5	1.1	11.6	1.3
14	0	0	0.5	0.6	4.5	0.9	7.8	1.0	12.2	1.0

to their chlorine equivalents and the percentages of chlorine added which had reacted with the sulfides were calculated and are given in Table III.

When the sewage was chlorinated to a residual, 22 to 27 per cent of the chlorine reacted with sulfides and the remainder reacted with other substances. With decreasing dosages of chlorine the percentage of the chlorine added which reacted with sulfides increased somewhat. When 25 per cent of the chlorine demand was satisfied, 32 to 38 per cent of the chlorine added reacted with the sulfides. It appears that when the quantity of chlorine added is limited, a greater percentage of the chlorine reacts with the sulfides, indicating that the reactivity of the sulfides with chlorine is greater than that of the other reducing substances present in septic sewage.

Discussion

In fresh sewage with only traces of sulfides present the bulk of the chlorine demand is due to substances other than sulfides. As the sewage becomes septic, both the chlorine demand and the hydrogen sulfide increase. Although the rate of hydrogen sulfide production is higher and therefore the chlorine demand of the sulfides is higher than in the fresh sewage, the quantity of chlorine demand represented by the sulfides is only about one-quarter of the total demand. Thus, during septicization both sulfides and other substances reacting with chlorine increase and contribute to the high chlorine demand.

To eliminate the hydrogen sulfide produced during the septic action, the chlorine dosage should be equivalent to 75 per cent of the demand as compared with 20 to 25 per cent required to prevent the production of hydrogen sulfide. On the basis of sewage used in this experiment, the dosage of chlorine required to prevent hydrogen sulfide production as compared with that required to eliminate it after being produced would be as follows:

1. Fresh sewage with 17 ppm. chlorine demand with 25 per cent of the demand satisfied requires only 4.2 ppm. of chlorine.
2. Septic sewage with 8 ppm. sulfides and 64 ppm. chlorine demand with 75 per cent of the demand satisfied requires 48.0 ppm. of chlorine. Thus the chlorine dosage required after sewage has become septic is more than ten times as high as in fresh sewage.

Table III

PERCENTAGE OF VARIOUS DOSAGES OF CHLORINE ADDED REACTING WITH SULFIDES

	Per Cent of Chlorine Demand Satisfied			
Days	100%	75%	50%	25%
4	27	32	35	38
7	22	26	26	33
10	24	29	27	32
14	25	31	30	34

Conclusions

The elimination of hydrogen sulfide odors of sewage after they are produced by septic action required nearly 10 times as much chlorine as the addition of chlorine to prevent their formation.

The reason for this is that 75 per cent of the demand has to be satisfied to eliminate the hydrogen sulfide as compared with the 25 per cent required to prevent its formation. In addition, the chlorine demand increases in septic sewage by virtue of the increases in hydrogen sulfide and the increase in other substances which react with the chlorine. The dosage of chlorine required to combine with sulfides is only one quarter of the total demand.

Addendum

Pomeroy & Bowlus, in a report[2] published after this paper was presented, have arrived at chlorine applied to sulfide destroyed ratios of 3 to 9, averaging 5.3. The results reported in the present paper give the following ratios:

Days	Chlorine Demand ppm.	H_2S ppm.	Chlorine Dosage* ppm.	H_2S Resid. ppm.	Ratio Cl_2 Applied: H_2S Destroyed
4	64.5	7.0	48.4	.3	7.2
7	102	8.8	76.5	.4	9.1
10	116	11.6	87.0	.8	8.1
14	114	12.2	85.5	.6	7.3

*On the basis of 75% of the demand.

The ratios obtained varied from 7.2 to 9.1 and are somewhat higher than average, but well within the range given by these authors for results obtained from sewer tests. They indicate that in bottle experiments the ratios may be somewhat lower.

On the basis of these ratios, Pomeroy & Bowlus conclude that it is more economical to destroy the sulfides after they are formed than to prevent their generation. The results presented in this paper are in contradiction to that conclusion. Under practical conditions to reduce the number of chlorinators, Pomeroy & Bowlus favor a compromise, namely, to destroy the sulfides and to use a moderate excess of chlorine to prevent sulfide formation in the sewer for 2 to 3 miles downstream. Complete prevention of sulfide formation by destroying the organisms in the sludge deposits and slimes, is according to the authors, theoretically attractive, but under practical conditions not always successful nor more economical.

References

[1]H. Heukelekian, "Sewage Chlorination for Odor Control," *Water Works and Sewerage*, Vol. 89, Pg. 302 (1942).

[2]Pomeroy, R., and Bowlus, F. D., "Progress Report on Sulfide Control," *Sewage Works Jour.* **18**, 597, 1946.

Correction to Equation!

On page 114 of the March 1948 issue of *Water & Sewage Works*, in the article by R. S. Ingols and P. E. Murray on "An Oxygen Consumed Test for Sewage" the equation shown

Oxygen Consumed Test for Sewage

is in error. The correct equation for determining oxygen consumed (O.C.) according to the test is as follows:

$$\text{O.C.} = 200\left\{\frac{\text{ml. blank} - \text{ml. thio. for sample}}{\text{ml. of sample}}\right\} - 0.23 \text{ ppm. Cl ion}$$

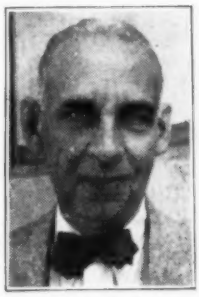
NEWWA'S MARCH MEETING

Features Meter Maintenance, Chlorination, Gadgets

BY HARRY A. FABER*
Editorial Associate
NEW YORK CITY

DURING the meeting of the New England Water Works Association in Boston, on March 18th, it was announced that the next several meetings will be held in Hartford, Conn., on April 21st; in Dover, New Hampshire, on May 20th; in Swampscott, Mass., on June 10th; and in New York City, where the Annual Convention will meet September 14 to 17.

President
Don C. Calderwood
Supt. Pennichuck Water Works Co.
Nashua, N.H.



Secretary
Joseph C. Knox
Sr. San. Engr.
Mass. Dept. Health, Boston

Water Works School

The Water Works School, open to all members, was the first item on the program of the meeting. "Flow Tests for Determining Pipe Friction," by **Professor Allan T. Gifford,** Massachusetts Institute of Technology, Cambridge, Mass., was the topic of this session. The meeting then followed its usual practice of providing separate Round Table Sessions for superintendents and for chemists.

Round Table Leaders and Speakers

H. A. Faber
Chemist
Chlorine Inst.
New York
(Chlorination)

S. L. Rogers
Supt. Distrib.
Water Bureau
Hartford, Conn.
(Meter Maint.)

F. E. Smith
Supt.
Filtration
Cambridge, Mass.
(Filtration)

Thos. E. Kennedy
Supt.
and Registrar
Fitchburg, Mass.
(Gadgets)

Allen Symonds
Mgr.
Water Service Co.
Millbury, Mass.
(Operation)

Metering and Meter Testing

(Reported by Roger Esty, Supt. of Water and Sewage, Danvers, Mass.)

The topic for discussion in the Superintendents' Round Table was Meters and Meter Testing. **Sherman Rogers,** Supt. of Distribution, Water Bureau, Hartford, Conn., opened the meeting with a statement that his department endeavors to abide by the Connecticut Department of Utilities ruling that all small meters shall be taken out of service, tested, and repaired every five years. Hartford, which has more than 200 meters from two to eight inches in size, tests these larger meters at least yearly. In cases where large quantities of water are used, testing is done semi-annually.

When asked about the approximate cost of repairing meters, Mr. Rogers said that for the Hartford system, which has about 40,000 meters, the 1947 cost per meter repaired was $4.75 for labor and parts; in 1934 the cost per meter was $5.34. The repair program was started in 1922.

Fred. J. Reny, Treas. and Gen. Mgr. of the Portland, Me., Water District, described his system, and stated that it was 50 per cent metered and that 70 per cent of the revenue comes from the meter rates. Portland inherited the meter rates some 40 years ago. In the case of some 500 large water users, the meters are checked monthly. Portland is fortunate in having an abundant supply with a gravity flow and the problems are not as serious as where the supply is limited or where filtering and pumping is necessary.

Nelson Boardman, Asst. Supt., Danvers, Mass., pointed out that the quality of the water is one of the determining factors in setting up a testing program. Soft waters such as lake water is generally soft and tends to lubricate the meter, rather than to cause wear. Ground waters which are harder and contain iron, etc., tend to wear the meters more rapidly. In Danvers, where the water is soft, some 400 to 500 are tested each winter. The total number of meters is 3400, which means that meters are tested every seven to eight years, although Mr. Boardman believes once in ten years is sufficient in that city.

William Duffy, Supt., Water and Sewer Dept., North Andover, Mass., recounted the story of what he had done to reduce his unaccounted for water. In 1921 with a 100 per cent metered system, the accounted for water was only 50 per cent. In 1937 a systematic program of meter testing was inaugurated. In 1943 a Pitometer survey was made for leaks. As a result of these two steps, the 1947 accounted for water was 87 per cent and the meter receipts were 82 per cent of the total income.

Roger Oakman, Supt., Water Works, Needham, Mass., discussed the economics of cycle testing of

*Research Chemist, Chlorine Institute, New York City.

meters, and raised the question as to whether or not it was more economical to test on a 5, 10, or 15 year basis. The question was not answered. In adjusting large meter bills where the high charge has been due to leaks, Mr. Oakman said it was Needham's practice to split the charge with the user, where the leak is underground and the property owner has no way of knowing it. No allowance is made to the user for toilet or plumbing leaks.

Alan F. McAlary, Supt., Rockland Water Dist., Rockland, Me., told some interesting stories about large water bills. One in particular shows the unusual causes of such bills. An elderly user consistently complained about high water bills. Meter tests and examination of plumbing and service lines revealed no leaks or other difficulties to which the high water bill could be ascribed. After the old man died, it was discovered why his water consumption had been so high. He had lived in fear that the hot water tank would blow up, and several times a day he would empty the tank so as to keep the water from becoming too hot. He had done this for years—and had paid for the water that went down the drain.

In addition to the above comments there were many ideas, discussions and conversations propounded across the floor and among the members present. As to the method for charging for meter rates, some favored service charges, others a minimum rate basis, while still others favored a sliding scale.

In reference to fire sprinkler lines, some superintendents believed fire lines should be metered, others that they should not. Some departments meter every fire line, others meter fire services only where there is a large amount of underground piping and a large number of hydrants.

Most water departments read meters and bill quarterly, but Needham, Mass., reads meters quarterly and bills semi-annually. A few places read and bill monthly.

Many opinions were expressed as to the advisability of testing meters singly or in batteries. The trend in water measurement during testing seems to be away from weighing and toward volumetric methods, using one large tank and one small one.

Some superintendents expressed a preference for testing by orifice methods, others by the gallon per minute method. When the gal. per min. method is used, comparisons can be made on the same basis as compared to the orifice method, for the gpm. depends on the pressure, through the orifice. It is obvious that a 1/16-inch stream will not deliver as many gallons per minute at 40 lb. pressure as at 60 or 80 lb. pressure.

"Fifty Years of Water Chlorination Practice," by Harry A. Faber, Research Chemist, The Chlorine Institute, Inc., New York, N.Y.

Water chlorination practice is based on accumulated knowledge, and Mr. Faber reviewed briefly the history of those men who pioneered in developing knowledge of this practice. The earliest recorded use of chlorine for disinfection of water in North America was in 1896 at Louisville, Ky. There, William M. Jewell chlorinated the effluent from rapid sand filters for a short period. The first decade, 1896 to 1906, was devoted largely to the experimental use of chlorine and to the gradual inception of chlorination on full scale.

The second decade was one of application. In 1908, the use of chlorinated lime was started at the Bubbly Creek plant of the Union Stock Yards in Chicago by C. A. Jennings. Later the same year, George A. Johnson inaugurated chlorination of the Boonton supply of Jersey City—the first municipal supply to be treated in this manner. In this period the ortho-tolidine test for residual chlorine was suggested by Phelps and colorimetric standards were devised by Ellms and Hauser. The application of gaseous chlorine became practical when Darnall, Ornstein, Kienle, and others devised suitable equipment.

In the third decade, 1916 to 1926, improved methods of controlling and applying chlorine were developed. Wolman and Enslow made the ortho-tolidine test practical for use in the smallest supplies. Race, at Ottawa, developed the chloramine method of treatment. Howard, at Toronto, studied and applied superchlorination practice. At Greeneville, Tenn., McAmis first used ammonia gas and chlorine gas to apply chloramine treatment.

From 1926 to 1936, chlorination became general practice in even the smallest water supplies; it was a decade of action. The fifth decade, 1936 to 1946, was one of refinement. A number of investigators made studies of the fundamental factors involved in chlorine reactions. With the development of the ortho-tolidine-arsenite test by Hallinan and Gilcreas, a new concept of chlorination is now being put into practice.

"Filter Plant Operation at Cambridge, Mass.," by Fred E. Smith, Chemist, Water Department, Cambridge, Mass.

The Cambridge filter plant will celebrate twenty-five years of operation in April of this year. Mr. Smith devoted his paper to a review of experiences during the period 1939-47. Excessive depletion in stored water during drought periods in 1940, '41, and '47 has complicated operating problems, since the Hobbs Brook Reservoir is generally used to keep water in reserve.

Stony Brook Reservoir in the Cambridge system is a prolific source of algae, especially Synura. Treatment with copper sulfate is an effective procedure, but this reservoir must not feed into the system while algae are being killed. Fresh Pond Reservoir is one which seldom develops algae growths, though treatment with copper sulfate was necessary during the winter of 1944 to control the development of diatoms which caused a drop in filter runs.

Water temperature has a marked influence on coagulation: This is demonstrated by the excellent color removal accomplished at 72° F. and by the very limited removal at 39° F. The detention time available for coagulation is now less than two hours, and inadequate coagulation has placed an excessive load on the filters. Sixteen filter units are available, and fourteen are in almost constant operation. Filter runs average only 15 hours of service, and the wash water consumed is 5.7 per cent of the total filtered. Wash water is returned to the pond and growths of algae have been decreased since this practice has been followed.

The post-chlorination treatment will be replaced with free residual chlorination of the raw water; lime application for pH control will be changed to the clear water basin effluent; flocculators are to be installed and other changes will be made in the sedimentation basins; these improvements are needed to meet present increased water demands.

"Waterworks Short Cuts or Gadgets," by Thomas E. Kennedy, Superintendent and Registrar, Fitchburg Water Department, Fitchburg, Mass.

Mr. Kennedy presented an excellent motion picture to illustrate the operation of a wide variety of commercial and home-made equipment which has been adapted to provide operating short cuts at the Fitchburg Water Department. As a beginning, the department keeps detailed rec-

ords and plans of the distribution system; it employs a special tracing desk and ozalid printer for making duplicate copies.

Many special technics used in meter repair work were shown. In addition to the usual mechanical shop equipment, Fitchburg has a forge and drop hammer, both acetylene and arc welders, and a special pit in the garage shop where a grease gun operating under 2700 pounds pressure is employed.

Outdoor equipment includes a hydrant pump operated from the fan belt of a truck, a crane-carrying truck for unloading and placing pipe, and pipe cleaning equipment utilizing a motor-operated wire brush.

"Some Highlights on Private Water Company Operation," by Allen M. Symonds, Water Utilities Service Corporation, Millbury, Mass.

Mr. Symonds reviewed briefly the background of water companies, holding companies, and mergers. The seven companies included in his corporation serve 56,000 customers in southern New England, covering a territory approximately 200 miles in diameter.

It was pointed out that private water companies generally are free from political influence and possess a broader managerial point of view. The privately owned companies must live on their income—and a considerable proportion of that income is used for the payment of local taxes. These companies consider it unwise to spend money on plants unless a return of 15 per cent can be realized.

These seven companies were reported by Mr. Symonds to show a plant value (cost of systems) of $2,096,237. Their 1947 revenue was $317,978, and this was divided as follows:

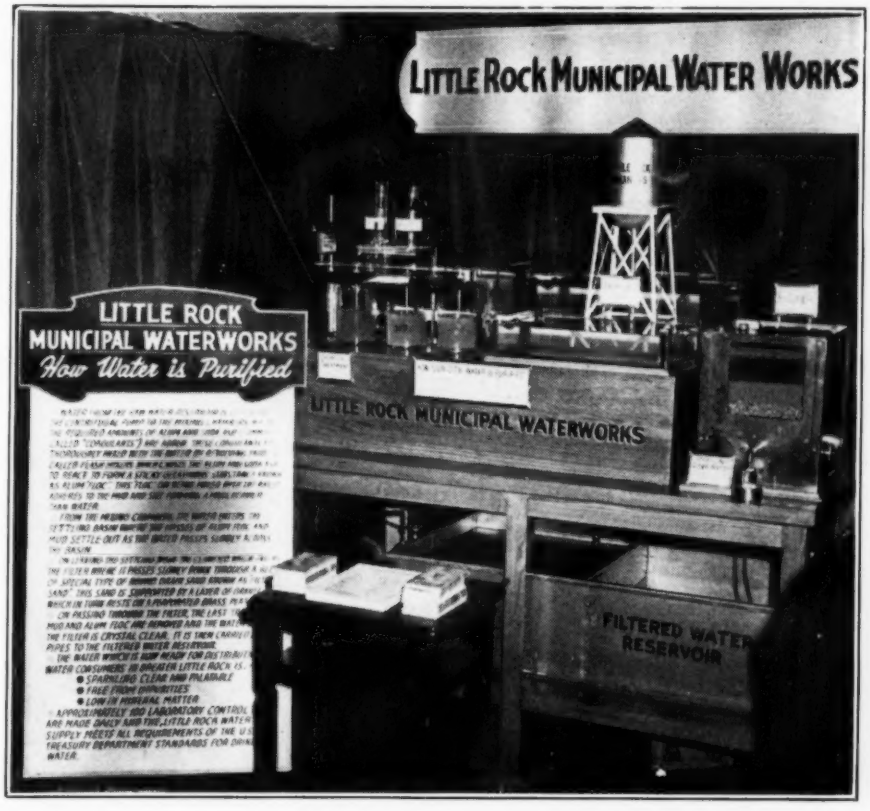
Operation	29.5%
Maintenance	5.0
Local Taxes	12.6
Federal Taxes	8.4
Interest	10.1
Dividends	19.3
Retirement	8.0
Surplus	7.1

It was emphasized that water bills are usually higher for customers served by private water companies, but it was pointed out that these customers always pay 100% of the cost as a direct charge. The author suggested that municipal water departments should be placed on a similar fully independent basis of operation.

LITTLE ROCK'S PUBLIC RELATIONS EXHIBIT

In the accompanying photograph is shown the miniature treatment and filtration plant designed for exhibit by the Little Rock Municipal Water Works of Little Rock, Ark. About this exhibit, L. A. Jackson, Manager-Engineer, writes — "At a Restaurant Show recently in Little Rock we exhibited for the first time a miniature treatment and filtration plant in complete operation. This included raw turbid water, then application of coagulants, followed by preliminary settling and ending up with a clear filter effluent. You will observe the raw water reservoir, lower left (printing hidden behind table with descriptive literature); the mixture of coagulants in the beakers; the settling basin, top center; and the filter plant at right. The clear filter effluent is spilling into a beaker on the table. Fluorescent lighting in the rear revealed very clearly the various stages of treatment in the filtering process.

"The exhibit was rather expensive, costing approximately $500.00 to construct. It received a lot of attention and, of course, now we plan to use it by demonstrating it to the many school classes that visit our plant."



(Ed. Note—This is a good example of what can be accomplished by a public relations minded water works manager.)

OHIO SECTION A.I.CH.E. WILL DISCUSS WATER AND WASTE

The Ohio Valley Section of the American Institute of Chemical Engineers is scheduling a one-day Symposium for Oct. 16, at which the subject of water and waste treatment will be the sole topic. The meeting will be held in the Engineering Society Headquarters Bldg., Cincinnati, Ohio, and is expected to be of considerable interest to persons along the entire Ohio River Valley. This interest is heightened by the fact that the "Ohio River Valley Water Sanitation Compact" will become effective within a short time. The purpose of this symposium is to provide a medium for disseminating technical information essential to the solution of stream sanitation problems.

SPRING MEETING N.Y. SECTION A.W.W.A. AT SYRACUSE

Inspection Trip and Discussion Program Featured

MEETING in Syracuse, N.Y. on April Fools Day, the members of the N.Y. Section of A.W.W.A. were treated to an inspection trip through the Electronics Park installation of General Electric Co.

Chairman
Elon P. Stewart
Supt. Dist.
Syracuse

V-Chairman
J. McWardle
Com. Pub. Wks.
Hudson

Electronics Park consists of 155 acres on which are situated nine buildings. These buildings, incidentally, cover thirty acres and one alone houses nearly nine acres. This latter one, known as the receiver building, contains the assembly lines for radio receivers. At the present time seven assembly lines are in operation on the production of all types of receivers but it is planned to increase the number of lines to 14 within the next several months and to make nothing but television sets thereafter.

Business Session

No elections were made at this meeting but several committee chairmen reported. M. L. BRASHEARS, Dist. Geologist, U.S.G.S. Jamaica, N.Y., explained that the Ground Water Committee has two objectives, first to set up a program whereby each convention will schedule papers on ground water, and secondly to set up an assistance group for members to aid them in solving ground water problems.

A report on wages and salaries made available a summary of prevailing salaries in water departments in New York state. In 17 different job classifications, data collected showed wide variations in payment for the same job in different cities.

Jack Diven, chairman of the membership committee reported 54 new members during the previous year (14 since January) and a total membership now of 627.

Fuller Award

Chairman of the Fuller Award Committee, R. G. Yaxley, Supt., Waterford, N.Y., presented the report of the committee as follows: "In recognition of many years of service to the association and particularly his outstanding work as chairman of the membership committee of the N.Y. Section, the Fuller Award Committee of this section recommends the award to JOHN DIVEN."

Syracuse Conduit

"Syracuse Extends Its Third Conduit" was the title of a paper with illustrations presented by ELON P. STEWART, Div. Engr. of Water, Syracuse. (Mr. Stewart is chairman of the N.Y. Section.) Syracuse has two 30-inch conduits and is adding the third to increase the supply. Mr. Stewart described how the cuts were made, the pipe laid, and the back fill made. Griffin Wellpoint equipment was rented and used to keep the trench dewatered. It was possible only to excavate one length at a time, and backfilling was done by an Allis-Chalmers bulldozer. During the winter months from Jan. 1 to April 1, the job was closed down, with 1600 ft. yet to be installed. The pipe is 54 inch steel, coated with concrete. The new pipe will increase the capacity by 2 mgd. There is yet needed another section of 5600 ft. to obtain the maximum capacity out of the three lines leading from Skaneateles Lake.

Fuller Awardee
J. M. Diven,
Leadite Co.
New York

Electrification

H. V. CRAWFORD, Application Engineer, General Electric Co., Schenectady, N.Y., presented an illustrated talk on *"Modern Electrification of Water Works."* New style motors for driving centrifugal pumps, new style transformer units, modern switchboards, and switch gear, operating panels, level controls and other innovations for improving operation of electrical equipment were included in the illustrations.

Kodak Pumping Station

The *"Kodak Park Pumping Station"* and its construction were the subject of the illustrated paper presented by ALLEN C. BAILEY, Water Development Engineer, Eastman Kodak Co., Rochester, N.Y. Until 1912, the Kodak Co. used city and well water in an amount up to 50,000 gpd. It was then necessary to increase the amount of water available. In 1918 raw water was pumped from Lake Ontario, but that was too turbid. Because chemically treated water was undesirable, Blaisdell filters were installed. These filters which were installed for a rate of 3 mgad. are now operating at a rate of 15 mgad. These filters employ continuous washing.

At intervals since 1921 the capacity of the plant has had to be increased, and by 1939 the capacity of the intake well was reached. This was increased by operating at a rate sufficient to lower the level in the intake well by five feet, thereby increasing the delivery of lake water to the suction well. More Blaisdell filters were added in 1941 and by 1942 the pumpage was 25 mgd. New construction was begun in 1946, a 54-inch reinforced concrete pipe intake being laid into Lake Ontario by divers. A new intake well and pumping station were also constructed. The pump station walls consisted of a concrete cylinder which was sunk into the ground by excavating inside and controlling the set-

Programmers

H. V. Crawford
Appl. Engr.
Gen. Elect. Co.
Schenectady

S. P. Carman
Cons. Engr.
Binghamton
Discussion Leader

tling of the concrete shell into the sand. The construction of these new additions was shown by slides.

Pre-Stressed Concrete Pipe

The *"Manufacture of Pre-Stressed Concrete Cylinder Pipe"* was presented by means of a motion picture. The presentation was made by PHILLIP HIRSCH, Vice President, Lock Joint Pipe Co., East Orange, N.J.

DISCUSSION PROGRAM

(Reported by W. W. Sanderson, Chemist, Div. of Labs., N.Y. State Dept. of Health)

A discussion program under the leadership of SIMON P. CARMAN, Consulting Engineer, Binghamton, New York, was held during the morning of the second day.

Alfred M. Roberts, President, Wanakah Water Company, Hamburg, New York, reported that he has reduced the cost of laying copper service by driving pipe through the soil and then pulling the copper service through the pipe. This also is done at Waverly and the pipe is left in place to act as a sleeve. Robert Grieve raised the question of whether earth movement or electrolytic action might not cause failure in the service where it enters or leaves the pipe. Elon P. Stewart, Division Engineer at Syracuse, described a power auger that he uses for placing wellpoints in hard clay, and he plans to try it for installing service pipes. R. Gordon Yaxley at Waterford jets a 1½ inch pipe through the soil from the main to the house and pulls a copper service through the pipe but he then removes the pipe. Allen C. Bailey, Water Development Engineer, Eastman Kodak Company, told of jacking 36-inch concrete pipe under a street by having a midget dig out the soil at the head of the pipe. Arthur Luce remarked that any jacking process should be continuous as troubles are sure to develop if the process is stopped and then started again.

Newell L. Nussbaumer, Consulting Engineer, Buffalo, New York, told of a suburb of Buffalo where builders were being urged to develop in areas in which utilities had already been installed. However, the real estate men prefer undeveloped land for building because it is cheaper and the houses can be sold before assessments for utilities have been applied. Allen H. Rogers, Supt. of Public Works, Garden City, said another difficulty in inducing construction on developed land was that builders preferred a large area where many houses could be built from one construction office and thereby reduce costs due to mass production.

Air Conditioning

Clayton O. Johnson, Superintendent of Board of Public Utilities, Jamestown, New York, advised that it had been necessary to increase the size of service pipes in a dozen or more places due to the large increase in water consumption by air conditioning equipment. Newell Nussbaumer mentioned instances where trouble had developed in sewers due to the discharge of waste water from air conditioning units. He also told of difficulties encountered where sewer charges are based on water consumption when water for air conditioning is taken from private wells and discharged to the sewers. At Elmira, New York, the trouble caused by waste water in the sewers from air conditioning units led to the passing of an ordinance requiring the return of such water to dry wells and its elimination from the sewers. Charles R. Cox, Chief of the Bureau of Water Supply, New York State Department of Health, Albany, described how the volume of waste water could be reduced 95 per cent by the use of cooling systems and re-use of the water. Such a procedure is in operation at Waterford and has been successful.

R. G. Yaxley
Supt. Water
Waterford

A. M. Roberts
Pres. Wanakah
Water Co.
Hamburg

Chas. R. Cox
Chief Bur. Water
N.Y.S. Health
Dept.

N. L. Nussbaumer
Cons. Engr.
Buffalo

H. E. Jordan
Exec. Secy.
A.W.W.A.

Participants in Discussion Session

Service Pipe

J. McClure Wardle, Superintendent of Public Works, Hudson, N.Y., reported that plumbers in Hudson had been installing lead goosenecks on copper service pipe. He asked whether there was any deleterious effect due to electrolytic action or if other cities had any regulations regarding this practice. Arthur T. Luce, New York Water Service Corporation, suggested that lead goosenecks were not necessary because the copper alone was flexible enough and the gooseneck merely added another joint. R. Gordon Yaxley, Superintendent of Water Commissioners, Waterford, reported that copper goosenecks were used with brass pipe in Waterford but that with copper pipe a little slack at the joint was all that was required. At Elmira, New York, lead goosenecks have been used without trouble and lead services in Albany have caused no deleterious effects. One objection raised to the use of lead with copper service pipe was that the lead sometimes melted during attempts to thaw a frozen service line.

Material Deliveries

In discussing the material delivery problem, Harry Jordan, Secretary of the American Water Works Association, reported that the total backlog of orders now on hand for cast iron pipe exceeds the 12-month capacity of the manufacturers and prompt deliveries are problematical. If the housing program should develop as planned this will require large quantities of pipe, thereby adding to the difficulties. It was Mr. Jordan's opinion that wartime controls will have to be reimposed to allocate materials, particularly when the European Recovery Program gets started.

Ground Water

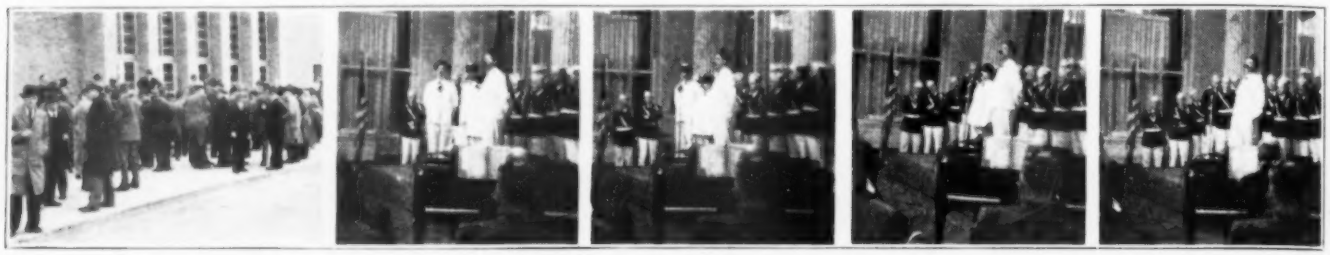
The ground water survey of New York State conducted by the United States Geological Survey has been completed in about 15 counties. Mr. M. L. Brashears, District Geologist, reported that the results have proven very valuable to consulting engineers and manufacturers as shown by the daily requests for information. He also reported that the state is fostering a law to require well drillers to keep and file a log of each well drilled. Clayton Johnson of Jamestown suggested that in the upstate area some control should be exercised over ground water resources, possibly by the Water Power and Control Commission, as at present practically anybody can sink a well anywhere. Mr. Cox pointed out that such control is exercised on Long Island. He also said that about one-half of the number of public water supplies in the state are from wells or springs and that most of the smaller communities could not afford surface supplies which generally require treatment. In regard to filing logs of the wells dug he said that an association of well drillers was being formed in the state and it was expected that as a result of the exchange of information between drillers a broader outlook would be instilled into the profession.

Diatomite Filters

Harold Rock, District Sanitary Engineer, New York State Department of Health, told of the installation of an experimental diatomaceous earth filter at the Village of Cherry Valley. If successful these units will be used to replace slow sand filters which at present clog fairly rapidly. Mr. Cox told of a few swimming pools now using the diatomaceous earth filters and as no coagulant is used no alkali has to be added. He thought the filters had potentialities for small supplies where turbidities are not too high but yet some filtration is necessary. The capacity of the filters can be increased by using an increased number of units. At Cherry Valley it is expected that a filtration rate of 56 gallons per minute can be maintained.

Sodium Silicate

The successful use of activated sodium silicate for treatment during the winter months was reported by Mr. Yaxley at Waterford. He found that only 20 per cent as much silicate as alum was needed when the silicate was fed after an alum pin point floc had been found. If the silicate was added before the alum nearly 50 per cent of the alum feed was required to accomplish the same results. Using 9 ppm. silicate with 40 ppm. alum optimum results were obtained and filter runs were greatly prolonged. Allen Bailey reported that the Kodak Park plant intends to use activated silicate for two main reasons. First, it keeps the sulfate content lower than when alum is used, which is important in paper making, and second, 5 ppm. silicate in jar tests gave very good floc with 1 gpg. alum. The silicate used is activated with acid and he said that Baylis had assigned his patents to the city of Chicago which had decided to charge a royalty to manufacturers who used the process but not to charge municipalities. In answer to a question on whether the use of activated silicate would affect the use of the water for boiler feed, Bailey replied that a few tests had shown an actual reduction of silica had been accomplished.



Inspection Trips—Entertainment—The American Legion Chorus and the Disappearing Quartet

J. D. Hall, Acting Supt. Ithaca, N.Y.

Resigns Batavia, N.Y., Post

John D. Hall resigned his position as superintendent of water, Batavia,

N. Y., to become acting superintendent of water and sewage at Ithaca.

Mr. Hall will be acting superintendent in the place of George Carpenter, on leave of absence for six months. Mr. Carpenter has been superintendent of water and sewage in Ithaca for a number of years.

Mr. Hall is a member of the Board of Trustees of the N.Y. Section of the A.W.W.A.

Interstate Sanitation Commission Orders Upheld

The Interstate Sanitation Commission, consisting of New York, New Jersey, and Connecticut was created in 1936 to curb the pollution of water contiguous to these three states. It has won its first court case upholding its right to issue mandatory orders to municipalities to abate pollution.

An injunction has been issued restraining the cities of Weehawken, West New York, and Union City, N. J., from discharging untreated sewage into the Hudson River. The order was originally issued nine years ago but has been extended from time to time because of material shortages during the war. The injunction becomes effective when the cities and the Commission can agree on a date to begin construction.

The Commission is under the direction of Seth G. Hess who stated that only one other court case is pending as most municipalities are glad to comply with the orders to abate pollution. New York City is now treating approximately 46 per cent of its sewage.

N.E.W.W.A. Moves Office

The New England Water Works Association has moved its office, according to an announcement from Joseph C. Knox, Secretary.

The office of the N.E.W.W.A. is now located at 204 Tremont Bldg., Boston 8, Mass.

THE ELIMINATION OF PHENOLIC TASTES BY CHLORO-OXIDATION

A Suggested Explanation of the Mechanism of Reactions in the Chlorination Process.

By R. S. INGOLS* and G. M. RIDENOUR*

School of Public Health
UNIVERSITY OF MICHIGAN
ANN ARBOR, MICH.

THE increase in industrial wastes has contributed many added problems in taste and odor control in potable surface water supplies. Prominent among these are the phenol wastes, phenols, or phenol like compounds. Both chlorine and chlorine dioxide have, when properly used, been quite effective in reducing the phenolic and chlorophenolic tastes. However, the mechanism of reaction of either of these chlorine bearing compounds that cause the reduction in the phenolic taste has not been clearly settled.

Todd[1] states that the extra chlorine in superchlorination attacks the phenol to form pentachlorphenol which is insoluble and settles out in the settling basin. Adams[2] and Faber[3] indicate that o-chlorophenol, p-chlorophenol or trichlorophenol or some mixture of these may be formed; with least taste occurring from the para or trichlorophenol. In the use of chlorine dioxide, the probability is that the trichlorophenol is formed, which causes the least taste. However, chlorine dioxide does not have uncombined chlorine atoms to substitute on the phenol ring so that it seems probable that some other compound than penta-chlor-phenol might be formed during the removal of the chlorphenol taste by chlorine dioxide.

A careful study of a standard textbook in Organic Chemistry[4] yields the information that either the oxidation of the phenol or the formation of trichlor-phenol are very readily accomplished by chlorine solutions. Oxidation of the phenol is favored by an alkaline reaction while pure substitution on the benzene ring is favored by an excess of acid, and both reactions may take place simultaneously in the absence of buffer or an excess of acid. A study of the ratios of the phenol to chlorine used in the reaction under conditions of pH that prevail in natural waters may shed some light on the principal reaction which takes place under natural conditions. Even a partial identification of the intermediate reaction products between phenol and chlorine and between phenol and chlorine dioxide should aid in a better understanding of the reaction. The data here given show the results of studies on the mixtures of phenol with chlorine and chlorine dioxide as related to their respective demands and other tests with the view of indicating what type com-

*Respectively, Instructor in and Assoc. Prof. of Pub. Health Engineering. Since the studies herein reported were made the senior author has joined the Civil Engineering Dept. of the Ga. School of Technology, as Associate Research Professor.

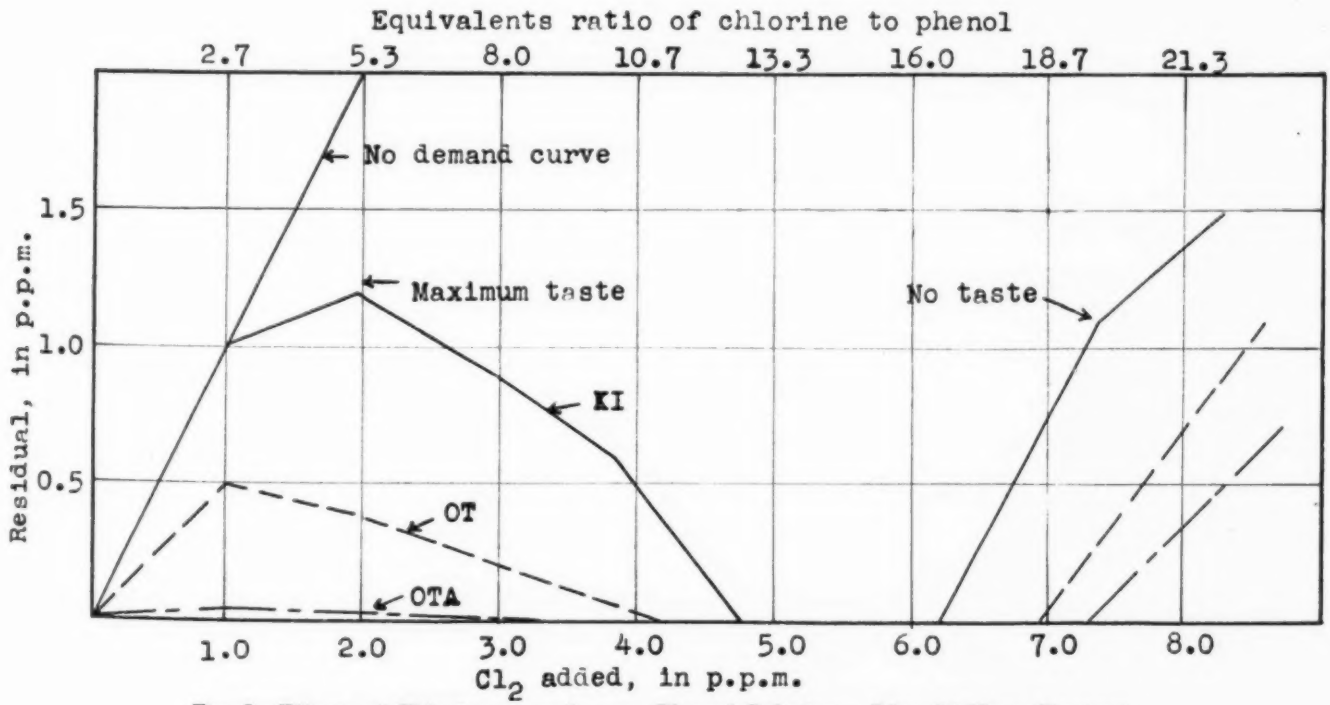


Fig. I—Effects of Chlorine on a 1 ppm. Phenol Solution—After 24 Hour Contact.

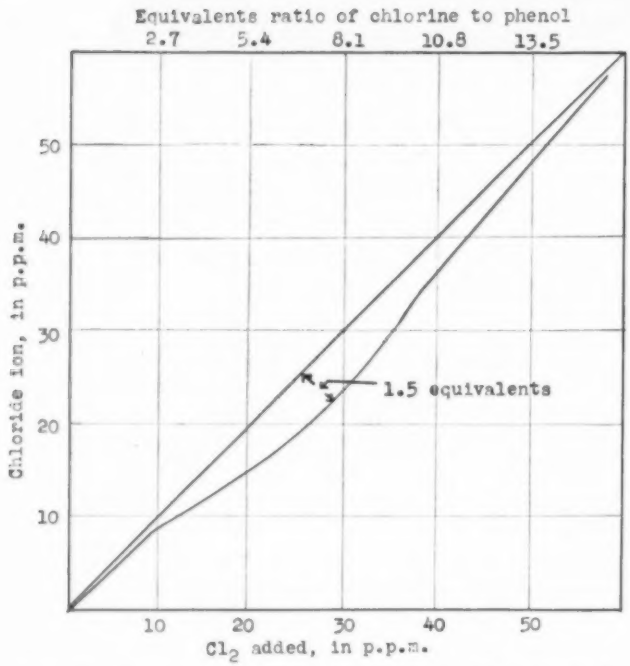


Fig. II—Recovery of Chlorides from Chlorinated Phenol Solution—10 ppm. Phenol.

pounds might be formed from the oxidation of phenol by chlorine bearing compounds.

Methods of Study

Freshly prepared pure phenol solutions were used in the study, to prevent any partial oxidation of the phenol by air. For purposes of accuracy a strong stock solution (500 ppm.) was made up frequently and the dilute solutions needed for a particular experiment were made from the stock solution as needed. An adequate amount of sodium bicarbonate as buffer was added to maintain the pH above 7.5 after mixing the phenol and the highest concentration of chlorine or chlorine dioxide. Standard solutions of chlorine or chlorine dioxide were added to phenol solutions of various strengths in the standard manner and the chlorine or chlorine dioxide demand determined. The results of these studies are shown in Figures I, II, and III.

Results

The results in Figure I show that the residuals from the reaction between 1.0 ppm. phenol and chlorine after 24 hours' contact are different depending upon the method of analysis employed. Beyond 6 ppm. the residuals indicate that there is free chlorine accumulating. At one to two ppm. of chlorine added, the orthotolidine-arsenite/ortho-tolidine ratio (hereafter referred to as the O.T.A./OT ratio) is not typical of "free chlorine," while the starch iodide residual indicates the presence of some other oxidant than free chlorine that can react with the iodide ion. Between 5-6 ppm., no chlorine residual remains. The ratio between the phenol and chlorine where the chlorine is in excess of that required by the reaction, is 1 to 16-18 equivalents. There is no "chlorphenol" taste in the presence of the free chlorine but the maximum "chlorphenol" taste occurs at the peak of the chlorine residual near 2 ppm. chlorine added. The taste is very persistent and no color develops within several days in the solutions of maximum taste. When 10 ppm. phenol is used with correspondingly higher chlorine concentrations there is obtained a good agreement as to the ratio of 16 or 17 equivalents of chlorine to one equivalent of phenol required to complete the reaction to maleic anhydride. However, no residual by any test persists at the lower chlorine doses as shown in Figure I.

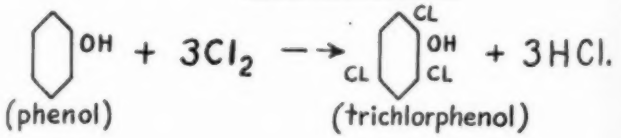
Results plotted in Figure II indicate that approximately 1.5 equivalents of chlorine are bound to the phenol ring in a form that is not recoverable as the chloride ion. This maximum concentration of *bound* chlorine is attained at 5 to 10 equivalents of chlorine added and then falls to a minimum as the reaction is completed at 16 equivalents of chlorine. The maximum taste of the chlorine-phenol reaction occurs in the area of the maximum "bound" chlorine and decreases as the amount of such "bound" chlorine decreases. The experiment reported in Figure II has been repeated several times and each run indicates that at least one and a half, but not more than two equivalents, of chlorine are bound to the phenol ring.

In Figure III the residuals from the reaction between phenol and chlorine dioxide after 24 hours' contact would on first examination indicate that chlorine dioxide is not as effective as chlorine in oxidizing phenols. However, there is a large reduction in the chlorite ion concentration as shown by the acid potassium iodide titration values, indicating that the chlorite ion may be responsible for at least a part of the oxidation of phenol. The accumulation of the chlorite ion after reduction of the chlorine dioxide does not permit an accurate quantitative interpretation of iodide oxidation data, but there is a slightly greater recovery of the oxidation capacity at 1 ppm. chlorine dioxide added than at any subsequent point. There is some quinone taste at this point and a typical conjugated quinone color develops within 24 hours in flasks at this ratio which contains slightly higher phenol concentrations than the 1 ppm. phenol used for Figure III.

Discussion

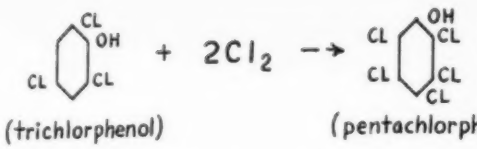
These data in relation to the possible mechanism which takes place are shown by the following reactions and comments:

Equation - I.



At high concentrations of phenol and chlorine this is a rapid spontaneous reaction because of the low pH produced by the reactants. At low concentrations of reactants an excess of acid must be used to obtain the chlorine in a molecular form rather than as hypochlorous acid in order to bring about substitution of the previously uncombined chlorine on the benzene ring. Six equivalents of chlorine are consumed by the reaction. All of the chlorine would be inert toward the iodide ion while 3 equivalents of chlorine would not react with silver nitrate. The pH required is too low to favor this reaction while the amount of combined chlorine is too high to fit the data from these studies.

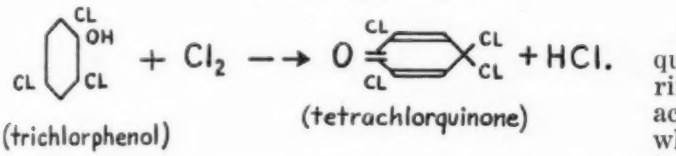
Equation -2.



This is a very slow reaction and is dependent upon the reaction of equation 1.

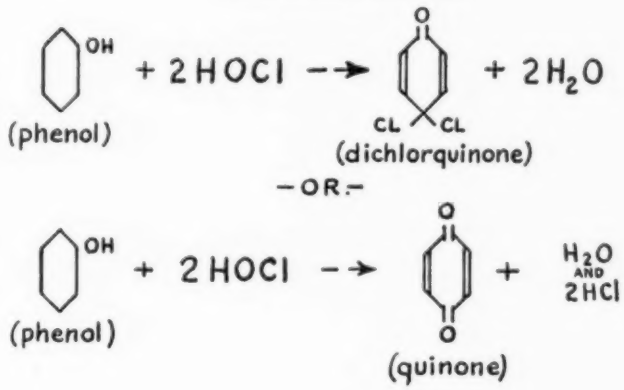
Fuming sulfuric is required to catalyze the introduction of the last two chlorine atoms on the phenol ring. Ten equivalents only of chlorine are needed and five would be attached to the ring while the data shows that sixteen equivalents are used, with two attached at a maximum and none at the completion of the reaction. It is extremely improbable that this reaction explains the disappearance of the chlorphenol taste, both because of the quantitative data and the conditions necessary for its formation.

Equation - 3.



The reaction in equation 3 depends upon the reaction in equation 1 but would occur much more readily than the formation of pentachlor-phenol in equation 2, for the reaction in equation 3 requires no pH adjustment. The tetrachlorquinone can react with one equivalent of iodide ion to liberate iodine which could be titrated with thiosulfate. A total of eight equivalents of chlorine would react with the phenol in the formation of tetrachlorquinone whereas sixteen were used in these experiments. A titra-table residual should develop after seven equivalents of chlorine were added and four atoms of chlorine would be bound to the ring. These data show, however, no more than two. If some tri-chlor-phenol is formed then tetrachlorquinone may well form, but we must consider that this is at best a side reaction while the principal reactions between phenol and chlorine at pH 7.5 are those in equation 4.

Equation - 4



This reaction shows an oxidation of phenol to quinone or a hypothetical dichlorquinone. The chlorine is shown as hypochlorous acid because the reaction takes place at pH 7.5. This is a rapid reaction which will occur with four equivalents of chlorine to phenol at which point it was estimated that the maximum concentration of taste occurs. Either the quinone or the dichlorquinone will oxidize the iodide ion, as shown for the 2 ppm. of chlorine added to 1.0 ppm. phenol in Figure I where a 50% recovery of the chlorine is indicated. It is considered likely that the failure of the partial oxidation product of 10 ppm. phenol to give this oxidation of the iodide ion indicates some intramolecular rearrangement because of the higher concentration of the material. Further evidence from the reaction of chlorine dioxide with phenol shows that quinone is formed under similar conditions of pH, temperature and sunlight to those used for the chlorine plus phenol.

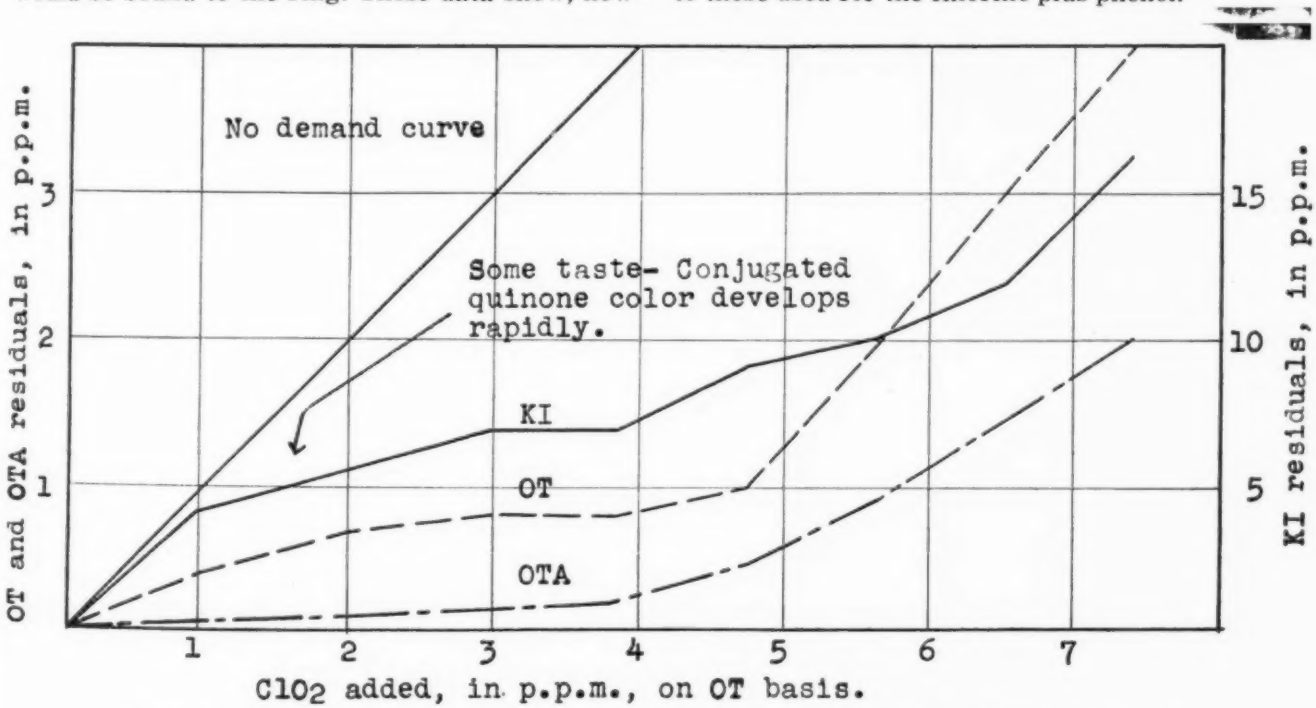
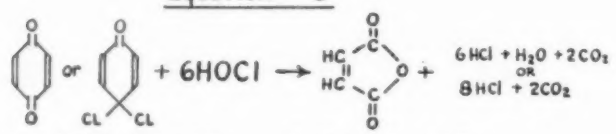


Fig. III—Effects of Chlorine Dioxide on 1 ppm. Phenol Solution—After 24 Hour Contact

The hypothetical dichlor-quinone is the compound submitted as the possible cause of the chlor-phenol taste. It is similar to quinone in its oxidation stage yet contains two atoms of chlorine as permitted by the data of Fig. II, while quinone contains no chlorine. The data of Fig. II further indicates that the concentration of one and a half to two equivalents of combined chlorine reaches a maximum at four to six equivalents of chlorine added where the taste is the greatest. It is considered likely that the bound chlorine data will not necessarily reach the theoretical value because the chlorine would be bound to an intermediate which is formed by oxidation and destroyed by the same mechanism. The reaction would not necessarily proceed in well segmented steps. Other points of difference between quinone and dichlor-quinone have been noted. Quinone conjugates readily to a characteristic colored, tasteless compound within 24 hours while dichlor-quinone (chlor-phenol) retains its taste and develops no color. The tastes of quinone and dichloroquinone are similar but not identical. Quinone fails to react with orthotolidine while the compound in Figure I appears to give some oxidation of orthotolidine. Because of these differences between quinone and the taste producing compound, and the number of chlorine atoms required, the hypothetical compound was formulated by combining quinone with part of the chlorine loading of well established tetra-chlor-quinone.

Equation - 5



(quinone) (dichlorquinone) (maleic anhydride)

The reaction in equation 5 is a slower reaction which indicates a possible mechanism for the complete destruction of the chlor-quinone or quinone taste developed in equation 4. Sixteen equivalents of chlorine are used overall in the reactions of equations 4 and 5 and agrees with the data of Fig. I. The final end product of the reaction, maleic anhydride, contains no chlorine, is tasteless and stable toward further oxidation and agrees with the data of Fig. II. This is a well established equation for the reaction between quinone and chlorine and thus supports the contention that "chlor-phenol" is really a quinone-like compound.

It is, therefore, concluded that chlorine oxidizes phenol to dichloroquinone (producing "chlor-phenol" taste) which is then destroyed by more chlorine or chlorine dioxide through further oxidation of the intermediate compound dichlorquinone. These reactions are best revealed in equations 4 and 5.

Present knowledge of the reaction properties of chlorine dioxide do not permit as accurate a quantitative interpretation of the data. However, it is postulated that the end products of the phenol/chlorine dioxide reaction are similar to phenol/chlorine reactions in that—first, they have a very similar taste; second, they develop the same color after standing and the conjugation of the quinone is permitted.

Conclusions

Experimental evidence of these studies indicate that in the treatment of phenol bearing waters with chlorine or chlorine dioxide:

(1) The "chlor phenol" taste is caused by a quinone-like substance (possibly dichlor-quinone) which is formed by the oxidation of phenol.

(2) The action of more chlorine oxidant upon the "chlor phenol" (or chlor-quinone) is one of further oxidation with rupture of the benzene ring and the formation of maleic acid rather than complete substitution upon the ring as in penta-chlor-phenol.

References

[1]Todd, A.R., "Maintenance of Chlorine Residual in the Distribution System," *J.A.W.W.A.* 34, 1805 (1942).

[2]Adams, B.A., "Substances Producing Taste in Chlorinated Water," *Water and Sewage Works Eng.*, 33: 109 (1931).

[3]Faber, H.A., "A Theory of Taste and Odor Reduction by Chlorine Dioxide," *J.A.W.W.A.*, 39: 691, (1947).

[4]Taylor, T. Clinton, "Reactions and Symbols of Carbon Compounds," The Century Co., New York City, 1930.

N.Y. State Health Dept. Recommends Fluoride Treatment for Children's Teeth

The State Department of Health of New York has come out in support of the use of fluoride solutions to reduce decay in the teeth of children. The Department's stand was taken after exhaustive study by its Dental Bureau on the basic research in this field. The method prescribed is safe, simple and inexpensive according to the Health Department, and it consists of swabbing the child's teeth with a solution of a fluoride salt which reduces dental decay by at least 40 per cent. Benefits appear to last from three to five years and it is recommended that the initial application be made when the child is three and repeated at ages 7, 10 and 13.

This recommendation of the State Department of Health of New York State is of particular interest inasmuch as the 10 year experiment on the use of fluorine in water for this purpose is being carried on in N.Y. state, where the two cities Kingston and Newburgh are being used as test cities, one in which the fluorine is being added, and the other which is used as a control. After two years experiments indicate that fluorine in the water is helpful, but the ultimate results will not be known for a number of years.

In connection with this subject of fluorine for prevention of dental caries, it is suggested that persons interested should obtain the Journal of the American Dental Association, Vol. 36, Jan. 1948, in which appears "The Michigan Work Shop on the Evaluation of Dental Caries Control Technics." This and four related papers form a Symposium of particular interest to persons who are considering the use of fluorine in water.

It Was Bound to Come

The accompanying ad was clipped from the garden section of a New York newspaper.

FLUORODENT BOX 771 SYRACUSE 1, N. Y.
Prevents tooth decay the natural way. Garden applied fluorine, safer than fluorine treated drinking water. Easy instructions, amazing literature included.
1-lb. $1 2½-lb. $2 5-lb. $3.50

Just in case the cut fails to bring the small copy out distinctly this announcement of "FLUORODENT" for the prevention of tooth decay states—

"Prevent tooth decay the natural way. Garden applied fluorine is safer than fluorine treated drinking water. Easy instructions and amazing literature included."

BALTIMORE HOST TO MD.-DEL. WATER AND SEWAGE CONFERENCE

A Report by
HARRY A. FABER*
Editorial Associate

ON April 15th and 16th the Maryland-Delaware Water and Sewage Association held its Twenty-First Annual Conference in Baltimore. A varied technical program was provided (several papers being illustrated with color movies and with lantern slides) and was sufficiently broad to include other municipal operations such as insect control, garbage handling, and housing. Presiding over these sessions were J. W. Engle, Retiring President, and R. C. Willson, President-Elect.

On the second day of the Conference, a paper "*The Need, Design, and Construction of the Water Tunnel to the Patapsco River*" was presented by Bernard L. Werner, Associate Engineer, City of Baltimore. This paper was followed by an inspection trip to the tunnel where members could witness the work in progress.

The social event of the meeting was the conference dinner and the floor show and dance following. During the business meeting, greetings were brought from the Federation of Sewage Works Associations, by G. S. Russell, Federation President, and from the American Water Works Association, by George E. (Doc) Symons representing Linn H. Enslow, Association President.

New Officers Elected

Officers elected to head the Maryland-Delaware Association during the coming year are:

President
R. C. Willson, Supt. of Water
Hagerstown, Md.

1st Vice President
A. A. Bailey, Filt. Engr.
Baltimore, Md.

2nd Vice President
Ralph E. Fuhrman, Supt. of Sew. Treatment
Washington, D. C.

Secy.-Treas.
Miss E. Virginia Gipe
Md. Dept. of Public Health

Members of the Executive Committee are: A. L. Genter, L. E. McClung, V. W. Faivre, and Harry Shaw.

Officers

Retiring Pres.
James W. Engle
U.S. Engrs.
Washington, D.C.

Incoming Pres.
R. C. Willson
Supt. Water
Hagerstown, Md.

1st Vice Pres.
A. A. Bailey
Filt. Engr.
Baltimore, Md.

2nd Vice Pres.
R. E. Fuhrman
Supt. Sew. Tr.
Washington, D.C.

Secy.-Treas.
E. Virginia Gipe
State Dept. Health
Baltimore, Md.

Considerable discussion was devoted to a report of the Short School Committee which recommended that no operators' school be held this year. The problem is one of facilities and staff organization. The serious need existing at present for operator training, however, was stressed by several speakers, and it was emphasized that the Association was founded primarily to benefit operators of small water and sewage treatment plants. Members voted approval of a plan enabling the school to be held late in 1948, and the Committee was assured of an instruction staff adequate to handle the project.

Technical Papers

A motion picture in color was presented by the American Cyanamid Co. under the title, "*Water, Water Everywhere.*"

This clearly illustrated the chemistry of water demineralization by ion exchange processes and showed practical applications of equipment. Laboratory development, pilot plant and full scale manufacturing processes, as well as testing of synthetic resins employed for anion and cation exchangers in the "Filt-R-Stil" units were pictured. Industrial results obtained by using demineralized water were illustrated in processes of cosmetic manufacture, textile treating, radio tube production, and in a wide variety of other industries.

"*The Ortho-Tolidine-Arsenite Test in Water Chlorination Control*" was discussed in a paper by HARRY A. FABER, Research Chemist, The Chlorine Institute, Inc., New York, N. Y.

The author pointed out that much of the present efficiency of water chlorination practice is due to improvements in the chlorine control test. There are two limitations to the ortho-tolidine test: it does not distinguish adequately between residual chlorine and certain interfering substances, and it does not distinguish adequately between the forms in which residual chlorine may exist in the water. A simple modification, the OTA test, uses only one additional reagent and eliminates both limitations. This test procedure is now in last edition of *Standard Methods*.

After describing the mechanism of this new test, Mr. Faber described its application to controlling chlorination practices. The proper use of combined residual and of free residual chlorination practices was reviewed, and results were cited to illustrate the differences in biological and chemical effects which could be accomplished.

*Research Chemist, The Chlorine Institute, Inc., New York, N. Y.

Executive Committee

A. L. Genter
Cons. Engr.
Baltimore, Md.

L. E. McClung
Filter Operator
Washington, D.C.

Vic Faivre
Water Chem.
Wilmington, Del.

H. Shaw, Dep. Chf.
Wash. Sub. San. Dist.
Hyattsville, Md.

It was shown that the water treatment problem to be solved would determine which practice should be employed, after which the OTA test provides the method for maintaining the proper treatment.

"Accomplishments and Program of the Maryland Water Pollution Control Commission" were described by PAUL W. MCKEE, Executive Secretary of the Commission.

This Commission, charged with the duty of investigating and controlling pollution, was organized under a new law passed by the Maryland General Assembly and effective June 1, 1947. Seven members comprise the Commission, three appointed by the Governor and four ex-officio: Director of the State Health Dept., Chairman of the Board of Natural Resources, Director of the Dept. of Game and Inland Fish, Director of the Dept. of Resources and Education. Its powers include the enforcement of pollution abatement with penalties. The Commission has no authority, however, to interfere in matters involving human health; the jurisdiction of the State Department of Health is preserved. Legal prosecution must be based on rules, regulations, or orders which have been previously issued.

Under its present program, the Commission has issued two general regulations: prohibiting the discharge of oil from any ship or vessel into state waters, and prohibiting the discharge of garbage into state waters. A pamphlet has been prepared outlining the general methods of cannery waste treatment and disposal. Municipalities are urged to study sewage disposal problems. Laboratory facilities are provided at Johns Hopkins University and are supervised by its Sanitary Engineering Department.

The Operators' Hour

Diversified experiences were reported in considering questions opened for discussion during the "Operators' Hour". The recreational use of reservoirs was of outstanding interest, the procedures followed at Washington Suburban Sanitary District, Baltimore, Norfolk, Newport News, and Washington being described in some detail. In summary, it was concluded that this use should be guided by local conditions and is entirely satisfactory when under proper sanitary supervision.

The advantages and disadvantages of using live steam to heat digesters was another question considered. No important disadvantages were reported, but several members considered this method to be simple, less expensive, and satisfactory in operation. Referring to a regular program for testing the overall efficiency of filter plant units, experiences were cited pointing to the advantages of this procedure. In one instance, replacing the impeller of a pump resulted in a power saving of $1800 per year.

The relation between cathodic protection devices and the need for protective paint on tank interiors stimulated much comment. Experience generally indicates the desirability of using both together. In old tanks, cleaning and repainting are needed to prevent corrosion underneath scale—even when cathodic protection is added. Several members expressed the idea, based on actual use, that cathodic devices slow attack but do not eliminate corrosion, and usual practice seems to indicate the need for both means of protection—whether in old or new tanks.

"A Community Program of Insect and Rodent Control" was described by GEORGE H. MASSEY, JR., Town Clerk, Crisfield, Md. Under expert supervision, DDT spray for mosquito and fly control and Antu for rodent control have been highly effective. Especially important in making this program successful has been the campaign to make the community sanitation-conscious and to enlist the active participation of civic organizations.

Garbage Disposal

A color movie was presented by C. V. JOYCE, Washington Suburban Sanitary District, to illustrate *"Trash and Garbage Incineration."* Problems such as adequate labor, temporary measures of disposal, and the actual return from salvaging operations were revealed. Modern equipment includes suitable trucks, an attractive incinerator building providing two Nichols incinerators, and automatic handling devices.

"Municipal and Individual Garbage Grinding" was the subject of a comprehensive paper by RALPH E. FUHRMAN, Supt., Blue Plains Sewage Treatment Plant.

The installation of household garbage grinders (considered by the author as preferable to central grinding stations because they eliminate household garbage cans and collection services) will increase the load on sewage treatment plants about 30 per cent. The increase will be gradual, however, and there is an advantage of perhaps 50 per cent gain in digester gas production.

Nine manufacturers are now producing about 200,000 household units per year. These sell at prices ranging from $75 to $125 but the installation cost adds from $10 in a new home to as much as $150 in an old building. Mr. Fuhrman showed these units to be

Programmers

Prog. Chairman
Roy Ritter
Partner
Whitman, Requardt Engrs., Balt.

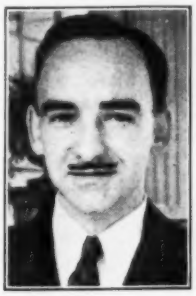
Chlorine
Harry Faber
Res. Chem.
Chlor. Inst.
New York

F.S.W.A.
Geo. S. Russell
Cons. Engr.
St. Louis, Mo.
(F.S.W.A. Prexy)

Water Leaks
H. Beckwith
Dist. Mgr.
Pitometer Co.
Pittsburgh, Pa.

relatively inexpensive, estimating a total cost of $150 and basing amortization on a twenty year period: amortization $7.50, water and electricity $1.50, total $9.00. The annual cost of garbage collection per capita per year is estimated to be $1.50, or for a family of four: collection $6.00, cost of cans $3.00, total $9.00. This method of disposal is so desirable that it is surprising many cities are reluctant to encourage its wider use.

C. E. Keefer
Supt. Sew. Tr.
Baltimore, Md.



P. D. McNamee
Operator
D.C. Sew. Tr. Wks.
Washington, D.C.

Leon Small
Water Engr.
Bur. of Water
Baltimore, Md.

E. A. Schmitt
Chief Water Div.
U.S. Engr. Office
Washington

Participants in the Discussions

Storm Drains

"Practical Design and Construction of Storm Drains for the Small City," by THOMAS S. CASSEDY, Whitman, Requardt and Associates, was an illustrated paper describing the advantages and disadvantages of many types of storm drains.

Mr. Cassedy presented rational formulas for estimating rainfall runoff and for determining the capacity of storm drains which should be provided. Modern improved types of drains were pictured. Since storm drains are usually constructed after other utility services are installed, the greatest economy will result from original planning—if possible, to have streets and drainage facilities follow natural ground runoff.

"How Housing Law Enforcement Works," by G. YATES COOK, Chief, Housing Division, Baltimore City Health Department, was a picturization of a problem more of social than of engineering implications.

Mr. Cook showed by lantern slides that 40 per cent of the population of his city live under blight conditions. Public housing, redevelopment, and enforcement of housing laws can redeem these areas. Only 20 per cent of the metropolitan residential areas are typical of the bad conditions, but they require 45 per cent of the cost of city services. Rates for tuberculosis, infant mortality, and meningitis are excessively high in such areas and this situation can be cured only by prevention of bad housing conditions.

Water Main Leaks

"How to Find Leaks in the Small City Without Using the Pitometer," was the title of an extremely practical paper presented by HOMER BECKWITH, The Pitometer Company. He suggested the subtitle "What to do until the doctor comes!"

Mr. Beckwith recommended that the search for leaks be started by first measuring the amount of water entering the distribution system as a whole, then cutting the system into small sections and devoting particular attention to night flows (this is the usual beginning of the Pitometer survey). By this procedure, certain areas will be found where excessive flows can be checked against users or non-users in that section of the system.

The second step is to employ listening devices (the Aquaphone, the Geophone, or electronic equipment) to narrow the location of the leak by listening on valves, fire hydrants, and individual services. Even if elaborate devices are not available, leaks can be found in small distribution systems with the simple Aquaphone; only certain stubborn or unusual types of leaks require greater sensitivity. Results may even be obtained by valving off one to two miles of the system and watching the drop in a reservoir or standpipe. Inspection of premises where use is high, or of swampy ground, may reveal unsuspected leaks from the distribution system.

Stream Pollution Meeting in Harrisburg, Pa.

On April 19 and 20 a joint meeting of the Interstate Commission on the Potomac River Basin and the Pennsylvania Sanitary Water Board was held at Harrisburg, Pa. Members of the water control agencies of the States of Maryland, Virginia and West Virginia were also in attendance. Discussions were held to coordinate research projects, stream sampling stations and other programs related to pollution abatement for the Potomac River Basin.

At the Harrisburg meeting a new advisory Land Use Committee was set up for the Commission. Its function is to advise the Commission on problems of soil conservation and utilization, erosion control and similar problems which affect pollution.

The Potomac River Commission itself was established by Compact of the States within the Basin and was activated in 1941. Its aim is cooperative planning for pollution abatement and control of the Potomac River Drainage Basin.

The Loudest You Have, Please!

It's to be a birthday present for my Uncle Sam Newkirk. He's the Water Sup't. of Elizabeth, N.J., and a past-president of the Amer. Water Works Ass'n.

Carl Crandall Succeeds W. L. Malcolm at Cornell

H. M. Gifft Becomes His Assistant

Following the death recently of William Lindsay Malcolm, Director of the School of Civil Engineering at Cornell University, President Edmund E. Day announced the appointment of Associate Professor Carl Crandall as acting director. At the same time, Associate Professor Howard M. Gifft was appointed as assistant to Professor Crandall. Professor Crandall is a native of Ithaca and a graduate of Cornell in 1912 and has been a member of the civil engineering faculty since 1914. Professor Gifft joined the civil engineering faculty in 1941 as an associate professor. He was formerly engineer with the Iowa Highway and Conservation Commissions, and is a graduate of Iowa State College.

PENNSYLVANIA ENGINEERING BUREAU REORGANIZED

REORGANIZATION of the Bureau of Engineering of the Pennsylvania State Department of Health has been made in order to expand operations of the Clean Streams Program of the Sanitary Water Board, according to an announcement by Dr. Norris W. Vaux, Health Secretary and Chairman of the Sanitary Water Board. The reorganization became effective on April 12th. Under the new setup Howard E. Moses, long Chief Engineer, has been upped to Consulting Chief Engineer, and J. R. Hoffert has been made Chief Engineer. Other changes are the creation of four distinct branches, three of which will be directed by Division Engineers' offices, newly created to bring about concentration of work in the new branches, and the fourth division to be directed by the Assistant Chief Engineer.

In the reorganization a number of Bureau Engineers have been promoted, and provision made for increased personnel.

According to the new organization plan, the Bureau will be under the general charge of H. G. Knox, recently appointed technical advisor, who will report to Dr. Vaux. Mr. Knox is a graduate of the United States Naval Academy and holds an M.S. Degree from M.I.T. as well as an M.S. in Electrical Engineering from Union College in Schenectady.

H. E. Moses, Chief Engineer and Director of the Bureau since 1937 and now Consulting Chief Engineer, has been with the Department of Health for almost 40 years of continuous service, having been engaged as assistant engineer in 1908. In 1917 he became chief of the water works and sewerage section, in 1922 he was appointed assistant chief engineer, and in 1937, chief engineer. "Ted" Moses, a graduate of Dickens College and the University of Maryland, is a life member of A.S.C.E., honorary member of the Federation of Sewage Works Associations and a Member of A.W.W.A. He has long been active in the Federation of S.W.A., and the Pennsylvania Sewage and Industrial Waste Conference, as well as the Pennsylvania Water Works Operators' Assn.

J. R. Hoffert, who has been assistant chief engineer since 1919, was advanced to succeed Mr. Moses as Chief Engineer. He is a graduate of Cornell University and has been active in sanitary engineering work for many years.

Appointed to the position of Assistant Chief Engineer is L. D. Matter, who has served as district engineer since 1923. Since 1940 Matter has been in charge of the district comprising 10 counties with headquarters in Harrisburg. He formerly served in Williamsport and Wilkes-Barre. In addition to being Assistant Chief Engineer Matter will direct the water supply division.

Three new divisions created include the Sewerage Division, the Mine Wastes Division, and the Industrial Wastes and Silt Control Division.

Charles H. Young, who entered the Department of Health as assistant engineer in 1924 and has served as district engineer of 11 Northwestern counties since 1928, will move to Harrisburg to take charge of the Sewerage Division.

L. S. Morgan, who entered the Department in 1922 and has served as district engineer for Southwestern counties since 1926, becomes a division engineer and will supervise both Western Engineering Districts and also the Mine Wastes Division. He will continue to maintain headquarters in Greensburg.

F. B. Milligan, who has been connected with industrial wastes work of the Bureau since he entered the Department in 1927, becomes division engineer in charge of the Industrial Wastes and Silt Control Division.

As a result of the reorganization other engineers have been upped in their positions. J. R. Harvey succeeds Mr. Young as district engineer in Meadville; R. W. Kremer, succeeds Mr. Morgan as district engineer in Greensburg; and Edward Edgerley, civil engineer in the Bureau, succeeds Mr. Matter as district engineer in Harrisburg. Other district engineers are B. S. Bush, Wilkes-Barre; L. K. Scheffer, Harrisburg, and M. J. Barrick, Williamsport.

H. E. Moses
Consulting
Chief Engr.

J. R. Hoffert
Chief
Engineer

L. D. Matter
Asst. Chief
Engineer

C. H. Young
Sewerage
Div. Head.

L. S. Morgan
Mine Wastes
Div. Head.

F. B. Milligan
Ind. Wastes
Div. Head.

C. R. Wyckoff Dies

Charles R. Wyckoff, who retired from the Sales Engineering staff of Wallace & Tiernan Co. two years ago, died recently at a convalescent home at Saranac Lake. "Charlie" Wyckoff, as he was known to his many friends throughout the water and sewage works field, had been associated with Wallace & Tiernan since 1930. About two years ago he developed T.B. and had been convalescing at Saranac Lake since. Before joining Wallace & Tiernan Mr. Wyckoff was an instructor at both Columbia and Cornell Universities. He was a member of Sigma Chi and Tau Beta Pi fraternities, the American Society of Civil Engineers, the Holland Society and other professional organizations.

ARE YOUR CUSTOMERS WATER CONSCIOUS?*

By ERNEST J. BEAR

Supervisor of Water and Sewers
LIVINGSTON, N. J.

ANY Waterman knows that the average American householder in an up-to-date community takes his water and sewer system for granted, but let there be no water or an abundance thereof, his party cellar flooded or a stoppage in the sanitary sewer causing it to back up, and we see a new rendition of the play, "Hellzapoppin."

A person may get deliveries of tons and tons of water each month right into his house at an average cost, in this day of high prices, of one thin dime per ton, one-tenth the cost of dirt, and yet the recipient remains wholly unaware of this fact. This unawareness of the consumer is an indirect compliment to the water operating and maintenance departments, for it takes intelligent design as well as cooperation on the part of the manufacturers, operators and maintenance men (add to this "eternal vigilance") to keep an uninterrupted, uncontaminated water supply.

It has been said, and rightly so, that next to air, water is the most important factor in human existence. Man can live only a few minutes without air and but a few days (or even hours in a desert) without water.

One Commissioner of Police expressed the importance of water in these words: "We all can buy guns and protect ourselves, but we can't all dig wells in a few days."

Water Conscious—Wrong Way!

Now the way to appeal to the public and make a lasting impression is through its self-interest. The person who deals in the occult may claim that each individual is a center of the universe, yet each individual considers himself subconsciously the center of the universe, for his physical sense impressions of the physical universe begin with his birth and cease with his death. Man's health is of vital interest to him—at least when he loses it. Herein lies the most effective education, as well as the most dangerous one, in the field of sanitation, as the following story will illustrate.

In a certain town, some years ago,

The Author

there lived a Water Superintendent; there was also a well known family. The elderly head of the house was taken sick. "Diarrhea," the family said. The family blamed the water. The day the complaint came in, a health officer went to the house and took a water sample. The sample proved negative. He interrogated practically everyone on the street; no one else was sick. What if someone else were found to be sick, perhaps from eating green apples?

More samples were taken. The next day the Superintendent personally blew off all adjacent hydrants. The whole family claimed to be sick. Weeks dragged by. One of the sons who was making daily deliveries of groceries to the homes of the townspeople, told all and sundry; he knew the water never was any good, so he never drank any, but just to prove that the water was the cause of his family's sickness he had drank some and, sure enough, he was sick for two days. (You see this man was water conscious, but not the right way.) The Water Superintendent knew this man well and was tempted to hunt him up and to reason with him, but the Superintendent knew the hot-headed stubbornness of this traducer and he knew that in an argument reason will slip on a bias; it takes time for reason to overcome prejudice and prejudgment.

Months passed, the old gentleman died of a heart condition, the doctor said; of bad water, the family said. This last suggestion was spread into all the homes by our crusading "water conscious" young friend. The Superintendent found himself on the spot. He knew the power of suggestion and that in no time at all any upset stomach would be blamed on the water by people who were getting water conscious the wrong way.

Water Conscious—Right Way!

Now this Superintendent at that time was standing very much alone. His Commissioner was absent on an extended vacation trip. It also seemed to him that some of the "Ins" or the "Outs"—political divisions—rather enjoyed his discomfiture. What to do? Two courses seemed to be open. The first course—a vigorous public denial of all rumors, legal prosecution if necessary. However, those who did not wish to believe would simply cry "fake" to any documentary evidence and very soon you would have a new political alignment based on opinion and expediency but not on facts. The Superintendent also remembered that about 30 years after the fact a historian mentioned a rumor, saying, "It is said," and for 2000 years we have been told and have liked to believe that Nero "fiddled" while Rome burned. A denial is negative. It always instills new life into slanderous rumor. The second course—do something positive which catches the fancy of the people and they will follow. The second course was adopted.

Water samples were taken all over town, and as they were taken from strangers and "unfriendly" houses, the Superintendent took them himself, because he considered himself responsible for the public relations phase of the problem. This wholesale taking of samples could, of course, arouse suspicion and act as a boomerang. So a short report was written to the Governing body. It was couched in positive language and no cognizance taken of any rumor. At the expense of the Superintendent a little humor was inserted. (Strange, isn't it, how we all like to laugh at the expense of someone else?) It stated the truth in a simple sentence to the effect that at no time was there any indication of any water borne disease. It also stressed the necessity for publicity in order that the public would not misconstrue the action taken. The papers publicized the report and that was the end to it, for it seems that most people still believe what they read.

*A paper presented at the North Jersey Water Conference, May, 1947.

Another Example

Then there was the party who lived on a "dead-end." For ten years no official complaints were made. The water department operated on the theory that if there are no complaints, everything is satisfactory. A new Superintendent, reasoning that prevention is better than cure, initiated a program of a twice yearly flushing out of all dead-ends. Whereupon he received an open postal card sent through the mail every two weeks with these words on it: "Mr. Superintendent, our water is bad again, please do something." Moreover, whenever the dead-end was blown off and the party had not been notified of the flushing, the water was still bad. If notified of the flushing, the water was O. K. This is not a single incident; most water superintendents could cite similar experiences of their own.

Many, many years ago an American novelist wrote a book. In it he depicted terrible labor conditions in industry and indirectly the disregard for public health by certain food processors. The book aroused a storm of protest. But the result was that Federal laws on pure food and drugs were enacted. It is perhaps only fair to name the novel: Upton Sinclair's "The Jungle." Years later Mr. Sinclair said, "While I aimed at the heart of America, I hit it in the stomach," or words to that effect.

Now in our efforts to make our consumers "Water Conscious" are we doing likewise? Are we, too, aiming at the head of the public and hitting it in the stomach?

I refrain from drawing conclusions, my mind is still open. What are your conclusions, based upon facts—not opinion?

Centrifugal Pump Troubles and Kinks*

A correspondent writes that every time he starts a centrifugal pump in his plant it must be primed. He states that the pump does not operate as well as it once did and he would like to know what is the matter with it.

Pump priming is not at all uncommon with centrifugal pumps. Even where foot valves are installed in the suction pipe for the purpose of holding the water in the pipe when the pump ceases to operate, air may get in and permit the water to drop. Sometimes foreign objects—pebbles, dirt, sticks, etc.—manage to get caught in foot valves, holding them open, and when that happens the purpose of the foot valve is defeated.

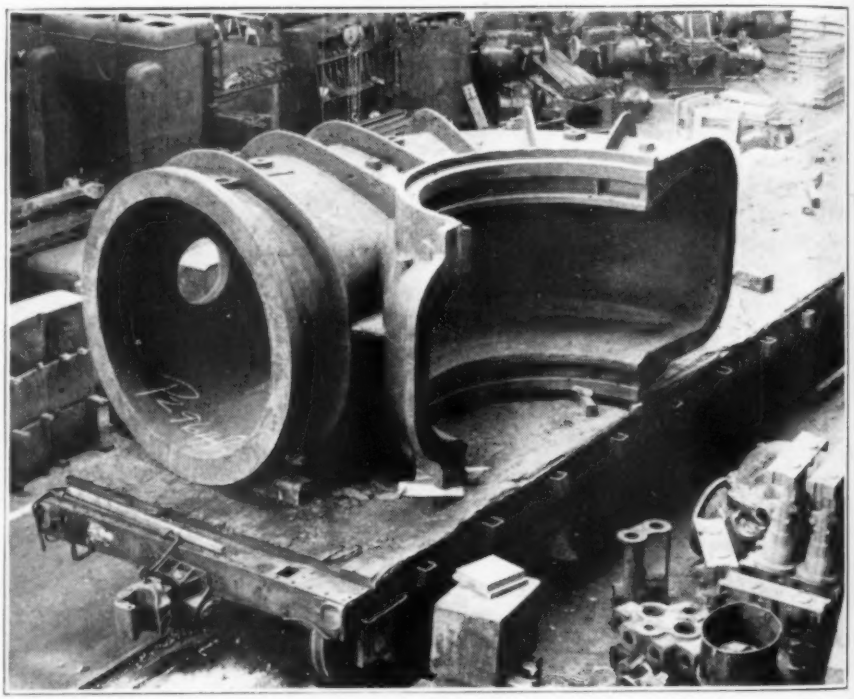
If air leaks into the suction line, as already stated, it is quite possible that all of the water will be drained out and the pipe will be filled with air instead of water. Air inleakage is further a "bad thing" in that it reduces the capacity of a pump, which may be one of the reasons why the above pump is not operating as well as it once did even after it is primed and operating. In some instances the air carrying ability of water is utilized where the pressure of the system is maintained pneumatically. Air is then purposely admitted into the suction, in small amounts, and continued until the pressure tank contains sufficient air.

Again, if the water being pumped is "too hot," similar trouble will be experienced. When it is too hot, steam will be generated in the suction pipe due to the reduced pressure. Thus for example if the temperature of the water being pumped is 212 deg. F. it cannot be pumped "by suction" at all. It will be necessary to submerge the pump in water of that temperature in order to pump it. If the temperature of the water is, say, 183 deg. F. the maximum lift is 15.4 ft. If the temperature is 170 deg. F. the maximum lift is 20 ft. And so on.

An interesting and valuable kink that was recently brought to this writer's attention in connection with centrifugal pumps is this: in some instances it is possible to increase the capacity of a centrifugal pump by changing impellers. Let us say, for instance, that you buy a pump for handling a given quantity of water against a given head at best efficiency. An impeller in that same pump which will handle more water will give a lower efficiency, so the thing to do is to use the "smaller" impeller. Then, when the time comes to pump the greater quantity of water the "larger" impeller is installed and it, in turn, handles that quantity of water at best efficiency.

*Contributed by W. F. Schaphorst, M. E., Newark, N.J.

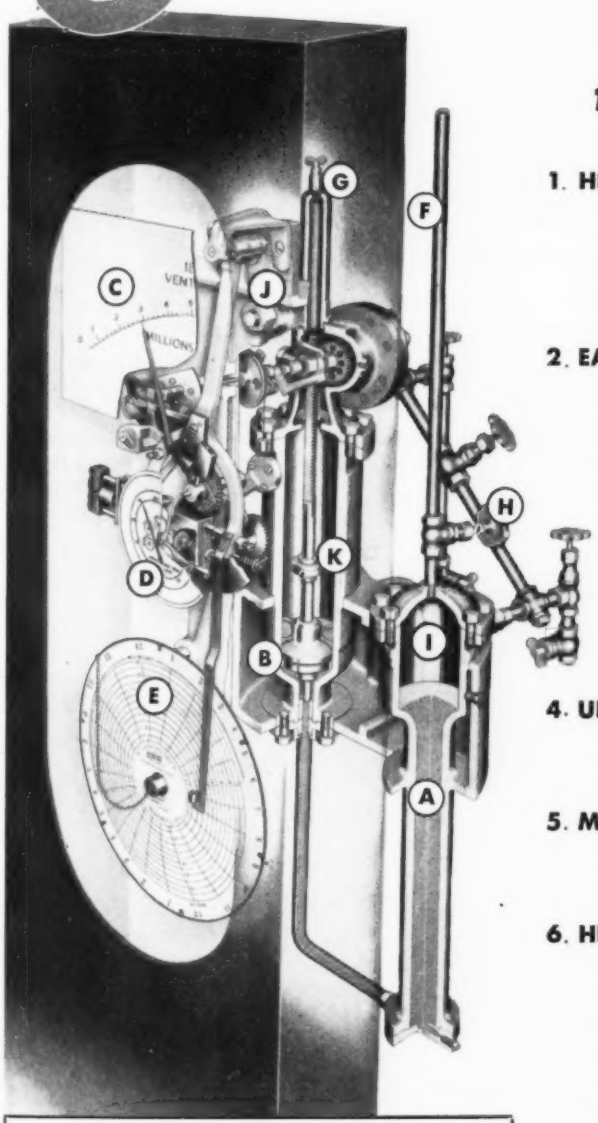
Some Pump!



The larger of two sections of casing for a "Mixflo" type of centrifugal pump in the shop of Worthington Pump & Machinery Corp. at Harrison, N.J. Three of these giants with capacity of 1170 cu. ft./sec. each against 35 ft. static head are being manufactured by Worthington for Detroit's new Bluehill Storm Sewage Pumping Station. Total pumping capacity—a mere 2,268,000,000 gals. per 24 hrs.

8 GOOD REASONS!

Why Builders Type M Meter Instrument is THE BEST BUY for Water and Sewage Works



1. HEAVY-DUTY "POWER PLANT":
Large wells containing 35 lbs. of mercury (A) and a solid float of 10¼ sq. in. area having a vertical travel of 4½" (B) provide the reserve power necessary for years of super-sensitive, accurate, and trouble-free operation.

2. EASY-TO-READ DIALS:
Separate Indicator 10" long, uniformly-spaced, direct-reading graduations (C); direct-reading Totalizer: 6 dials, largest dial 3½" dia. with fast-moving hand for precision reading (D); uniformly-spaced, direct-reading Blueline Charts 12" nominal dia. for correct perspective and equal ease and accuracy of readings at low and high rates of flow (E).

3. BUILT-IN CALIBRATING DEVICE:
Accuracy of registration easily and quickly checked in the field by means of built-in water head test pipe (F).

4. UNAFFECTED BY TRAPPED AIR:
Trapped air has no effect on accuracy; air easily removed through a valve at the top of each well (G and H).

5. MEEHANITE IRON:
Mercury wells (I), main bracket on which mechanism and wells are mounted (J), and float (B) are high-tensile MEEHANITE iron.

6. HIGH ACCURACY — WIDE RANGE:
Registration with plus or minus 1% (response to differential induced by actual flow rate) over range of 100% to 6⅔% capacity for Model MDUA; within plus or minus ½% from 100% to 50% and within plus or minus 1% from 50% to 5% of capacity for Model MDUAX.

7. POSITIVE OVERLOAD CHECK:
Check valve (K) prevents loss of mercury even at extreme overload differentials.

8. LONG LIFE:
Type M Instruments installed over thirty-five years ago are still "going strong"!

For Bulletin D7-200, address Builders-Providence, Inc. (Division of Builders Iron Foundry), 10 Codding Street, Providence 1, R. I.

BUILDERS PRODUCTS

VENTURI, PROPELOFLO AND ORIFICE METERS KENNISON NOZZLES • VENTURI FILTER CONTROLLERS AND GAUGES • CONVEYOFLO METERS • TYPE M AND FLO-WATCH INSTRUMENTS • WHEELER FILTER BOTTOMS • MASTER CONTROLLERS • FILTER OPERATING TABLES MANOMETERS • CHRONOFLO TELEMETERS

BUILDERS PROVIDENCE
Instruments

Magic? Office workers along NW 1 drew their first full breath in a week Wednesday as city workmen eliminated the foul smell of underground sewer lines. A small amount of cloroben, a new chemical, was sprayed into the openings and completely eliminated odors which plagued NW 1 from Shartel to Broadway.

SAID THE PRESS

and

we can only add

Stop Odor Complaints
Prevent H.S Corrosion
Cut Maintenance Costs
Control Sewer Insects
Reduce E. Coli Counts

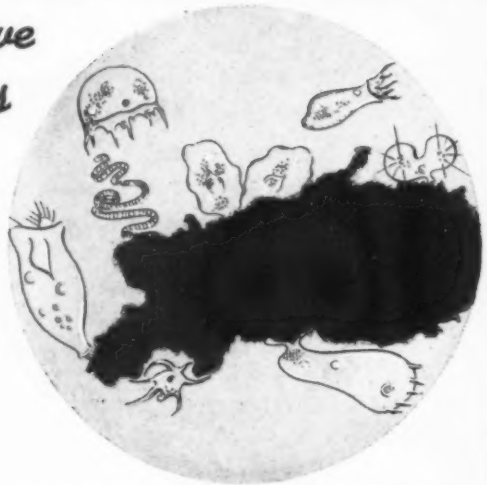
and receive a Non-Septic Sewage, easy to handle, at your plant

all with UP-SEWER Cloroben TREATMENT

THE CLOROBEN CORPORATION
15 EXCHANGE PLACE JERSEY CITY 2, N. J.
The Pioneers of Up-Sewer Treatment

MASS ACTION

of Active Aerobes



Available for both Activated Sludge and Trickling Filter Sewage Plants

Accelo-Biox* system provides Mass Action for the activated sludge process.

Accelo*Filter system provides Mass Action for trickling filter plants.

Ask for more information. INFILCO Inc., 325 W. 25th Place, Chicago 16, Illinois.

*Trade-Mark Reg. U. S. Pat. Off.

IF YOU WANT TO KNOW — ASK INFILCO

MEETINGS SCHEDULED

MAY 12-15—BOISE, IDAHO (Hotel Boise)
Pacific Northwest Section, A.W.W.A., Sec'y, Prof. Fred Merryfield, Oregon State College, Corvallis, Ore.

MAY 20—DOVER, NEW HAMPSHIRE
New England Water Works Association, Sec'y, Joseph C. Knox, Statler Building, Boston, Mass.

JUNE 4-5—NIAGARA FALLS, N.Y. (Hotel Niagara)
New York State Sewage Works Association, Sec'y, A. F. Dappert, State Dept. of Health, Albany 1, N.Y.

JUNE 7-11—CHAPEL HILL, N.C. (University of North Carolina)
North Carolina Waterworks Operators' Association. Sec'y-Treas., Max D. Saunders, P. O. Box 1126, 23 Oakwood Drive, Chapel Hill, N. C.

JUNE 7-11—STATE COLLEGE, PA.
Pennsylvania State College Sewage Works School. Director, Prof. Robert E. Stiemke, Sanitary Engineering, State College, Pa.

JUNE 7-12—GAINESVILLE, FLA. (University of Florida)
Florida Water & Sewerage Conference and Short Course. G. M. Turner, Ass't Dean, Univ. of Florida, Siegel Bldg., Gainesville, Fla.

JUNE 9-11—AUBURN, ALABAMA (University of Alabama)
Alabama Water & Sewage Association, Sec'y, Alex. O. Taylor, Alabama Polytechnic Institute, Auburn, Ala.

JUNE 9-11—AUBURN, ALABAMA (University of Alabama)
Alabama Water & Sewage Operators Short Course & Conference. Director, Alex. O. Taylor, Alabama Polytechnic Institute, Auburn, Ala.

JUNE 10—SWAMPSCOTT, MASS. (New Ocean House)
New England Water Works Association (Annual Outing) Sec'y, Joseph C. Knox, Statler Building, Boston, Mass.

JUNE 18-19—MILWAUKEE, WISC. (Schroeder Hotel)
Central States Sewage Works Association. Sec'y-Treas., Paul W. Reed, 1098 W. Michigan St., Indianapolis, Ind.

The Sensational New

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MODEL 87

GOLDAK

PIPE LOCATOR

Goldak Invites Comparison

- Shows - not approximate but *EXACT* location of buried pipes, mains, services, gates, tees, ells, stubs, etc.
- Featherweight - only 11 lbs. complete.
- No trick tubes or other hard-to-get parts. Uses readily available standard miniature radio tubes and flashlight batteries.
- Compact in design, ruggedly built for lifetime use.
- Operating simplicity. A one-man instrument.
- Guaranteed superior performance - resulting from 15 years of electronic research and construction of locating instruments.

GOLDAK *OUTSELLS* - BECAUSE IT *EXCELS*

WRITE FOR DETAILS
THE GOLDAK COMPANY
1544 West Glenoaks Blvd., Glendale 1 California

MEETINGS SCHEDULED

JUNE 23-25—DAYTON, OHIO (Dayton-Biltmore Hotel)
Ohio Conference on Sewage Treatment. Sec'y-Treas., G. A. Hall, State Dept. Health, State Dept. Health Bldg., Columbus 15, Ohio.

AUG. 23-25—CHATTANOOGA, TENN. (Hotel Patton)
Kentucky-Tennessee Section A.W.W.A. Sec'y, R. P. Farrell, 420—6th Ave. N., Nashville 3, Tenn.

AUG. 23-25—STATE COLLEGE, PA. (Nittany Lion Inn)
Pennsylvania Water Works Operators' Association. Sec'y-Treas., I. M. Glace, 1001 Front St., Harrisburg, Pa.

AUG. 25-27—STATE COLLEGE, PA. (Nittany Lion Inn)
Pennsylvania Sewage & Industrial Wastes Association. Sec'y-Treas., Bernard S. Bush, Kirby Health Center, Wilkes-Barre, Pa.

SEPT. 1-2—WINNIPEG, CAN. (Royal Alexandria Hotel)
Minnesota Section A.W.W.A. Sec'y, R. M. Finch, 416 Flour Exchange, Minneapolis, Minn.

SEPT. Date not set—MINOT, NO. DAK.
North Dakota Water & Sewage Works Conference. (20th Annual Convention.) Sec'y-Treas., Jerome H. Svore, State Health Dept., Bismarck, N. Dak.

SEPT. 14-15—DES MOINES, IOWA (Hotel Kirkwood)
Iowa Sewage Works Association. Sec'y-Treas., Leo Holtkamp, P. O. Box 310, Webster City, Iowa.

SEPT. 14-17—NEW YORK, N. Y. (Hotel Pennsylvania)
New England Water Works Association. Sec'y, Joseph C. Knox, 609 Statler Bldg., Boston, Mass.

SEPT. 16-17—CHEYENNE, WYO. (Hotel Plains)
Rocky Mountain Section A.W.W.A. Sec'y, O. J. Ripple, 710 Colorado Bldg., Denver 2, Colo.

SEPT. 22-24—FLINT, MICH. (Hotel Durant)
Michigan Section A.W.W.A. Sec'y, Raymond J. Faust, State Dept. of Health, Lansing, Mich.

SEPT. 29-30—CLARKSBURG, W. VA. (Stonewall Jackson Hotel)
West Virginia Section A.W.W.A. Sec'y, John B. Harrington, State Dept. of Health, Charleston, W. Va.

SEPT. 30-OCT. 1—SIOUX FALLS, SO. DAK. (Carpenter Hotel)
South Dakota Water & Sewage Works Conference. Sec'y, W. W. Towne, State Board of Health, Pierre, So. Dakota.

OCT. 5-6—FORT DODGE, IOWA (Hotel Wahkonsa)
Iowa Section A.W.W.A. Sec'y, H. V. Pedersen, Municipal Bldg., Marshalltown, Iowa.

OCT. 7-8—MANSFIELD, OHIO (Mansfield-Leland Hotel)
Ohio Section A.W.W.A. Sec'y, F. P. Fischer, 812 Perry Payne Bldg., Cleveland 3, Ohio.

OCT. 10-13—GALVESTON, TEXAS (Buccaneer Hotel)
Southwest Section A.W.W.A. Sec'y-Treas., L. A. Jackson, Robinson Memorial Auditorium, Little Rock, Ark.

OCT. 13-15—ATLANTIC CITY, N. J. (Haddon Hall)
Pennsylvania Water Works Association (52nd Annual Meeting). Sec'y, E. R. Hannum, P. O. Box 315, Windber, Pa.

OCT. 13-15—BOSTON, MASS. (Statler Hotel)
American Society of Civil Engineers. (Fall Meeting.) Ass't. Sec'y, Allen Wagner, 33 West 39th Street, New York 18, N. Y.

OCT. 13-15—MONTGOMERY, ALA. (Whitley Hotel)
Alabama-Mississippi Section, A.W.W.A. Sec'y, John L. Snow, First National Bank Bldg., Montgomery, Ala.

OCT. 15-16—PHOENIX, ARIZ.
Arizona Water & Sewage Works Association. Sec'y-Treas., George W. Marx, San. Eng. Div., State Dept. of Health, Capitol Bldg., Phoenix, Ariz.

OCT. 18-21—DETROIT, MICH. (Statler Hotel)
Michigan Sewage Works Association. Sec'y-Treas., R. J. Smith, 545 Elizabeth St., E. Lansing, Mich.

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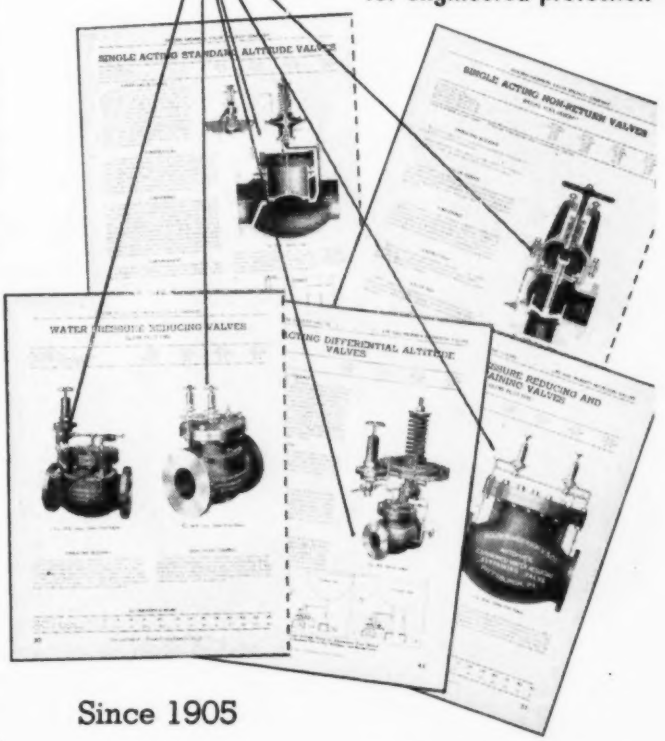
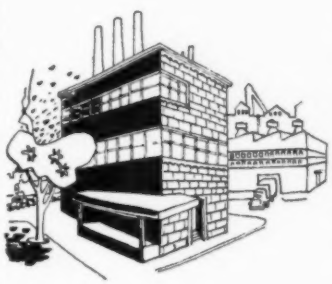
VALVES

over 1500 types and sizes for engineered protection



Since 1905



For more than 35 years Valves by Golden-Anderson have proven satisfactory in the protection of life and property. Engineer-designed to give safe, dependable control under even the most difficult and adverse conditions. For complete informative and technical data, send our engineering department your most difficult assignment.

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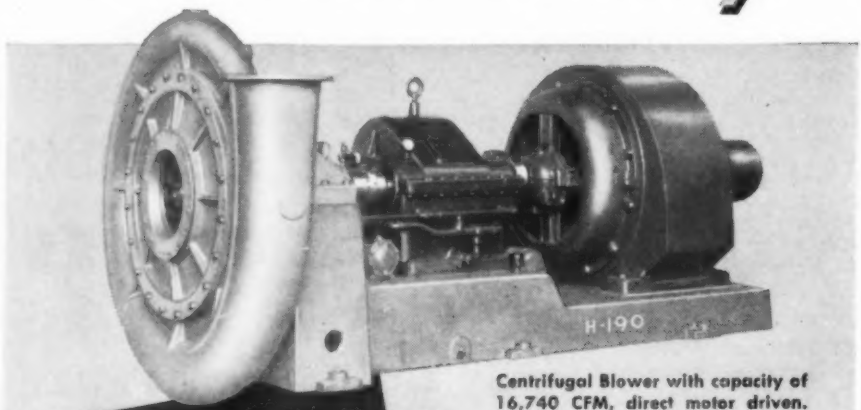
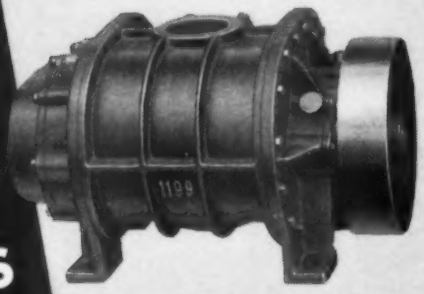
R-C dual-ability



Centrifugal Blower with capacity of 16,740 CFM, direct motor driven.

..TO SOLVE *Blower* PROBLEMS



Rotary Positive Blowers are available in a wide range of capacities, from 5 CFM up.

That's important—our *dual-ability* to supply either Centrifugal or Rotary Positive Blowers. It means that our recommendations are always unbiased. We suggest the equipment that experience has proved will best meet the specific conditions.

For sewage works plants and waterworks, many factors influence this decision. Capacities, pressures, drives, dimensions, weight and other characteristics are carefully considered. First cost, operating economy and deliveries are important points.

Our wide experience enables us to make sound recommendations. The accuracy of our engineering and sturdiness of our blower construction have been proved for many years.

For practical, up-to-date answers to your blower problems, you can depend on R-C *dual-ability*.

The first Rotary Positive Blower built by anyone was produced in the "Roots" plant in 1854—six years before the first pony express. We're not good because we're old, we're old because we're good!

ROOTS-CONNERSVILLE BLOWER CORPORATION
805 Mount Ave., Connersville, Ind.

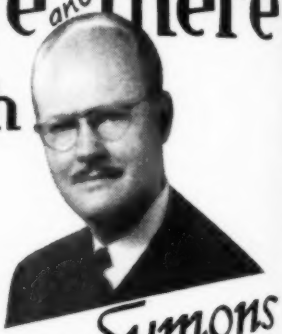
ROOTS-CONNERSVILLE ROTARY CENTRIFUGAL

BLOWER BUILDERS R-C SINCE 1854

BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

• • ONE OF THE DRESSER INDUSTRIES • •

Here and There with Doc Symons



H.T.M.A. — And this month I think I ought to tell you why I really explained what H.T.M.A. means. Of course, you know that it actually stands for "Here's That Man Again", and I was content to use it as a teaser until A. E. Franzozo, operator of the Johns-Manville Waste Treatment Works at Manville, N. J., asked me if it meant, "Hello To all My Admirers."—Now Tony, I know I'm a conceited a - -, but am I really that bad? Another big man—and I do mean BIG — at Johns-Manville, Jimmy (Transite Pipe) Walker, thought it meant "Here and There More Anecdotes"—Sometimes, could be—I hope.

* * *

When it comes to being a comedian on a platform, I don't know of anyone who can amuse an audience more than T. H. (Ted) Kain, Manager of the Columbia, Penna., Water Works. Ted's own barbed wit and his running duels with hecklers in the audience are calculated to keep anyone from going to sleep when he is on the platform. Ted is also somewhat of a sartorial delight to the eye, if you like the type of clothes which Bing Crosby has made famous. Even Ted's wife can't help but notice his haberdashery.

One night Ted was going to a meeting that involved the practice of some good public relations (and Ted is one of the better practitioners of the art of P.R.), when his wife called to him as he started to leave and said, "Why, Ted, go look at yourself in the mirror, you can't go dressed like that." Ted looked and said, "What's the matter?"

"Why darling, your coat and pants match."

* * *

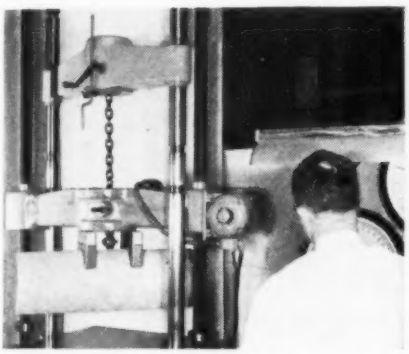
It was at the Joint Meeting of the N.Y.S.S.W.A. and the N.E.S.W.A. in Albany last May, and several of the boys at one of the tables, where

Engineering Facts about

Johns-Manville TRANSITE PRESSURE PIPE

Tapping for Service Connections

One of the many practical features of Transite* Pressure Pipe is the ease with which it may be tapped for service connections. Proof of this is evident in the hundreds of thousands of corporation stops which, over the years, have been inserted in Transite water mains. Year after year, these installations continue to serve their communities with efficiency and economy.



Laboratory tests demonstrate the strength of service connections made in Transite Pressure Pipe. In a recent series of such tests made on 8" Class 150 pipe, it required an average force of 4360 pounds to pull a ¾" corporation stop from the pipe.

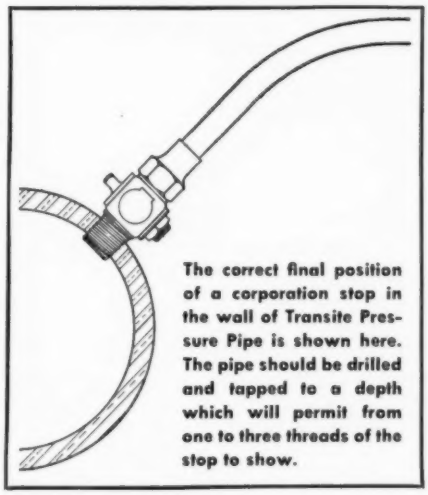
Transite Pipe can be tapped wet or dry; standard tapping machines are used. The special asbestos-cement composition which gives Transite its toughness and durability also provides excellent threading properties. The threads are sharp, clean and strong. Service connections are tight and lasting.

To facilitate tapping and insertion of the corporation stop, the use of a lubricant such as graphite and oil on the tap and the threads of the stop is recommended.

As this photograph shows, Transite Pipe takes clean, sharp threads. Strong and firm, these provide perfect seating for the threads of the corporation stop, assuring a watertight service connection.

Taps may be made with either Corporation Stop threads or Iron Pipe threads. While the standard combined drills and taps may be used, special alloy ones have been developed and are available from leading manufacturers. Field experience shows that these special drills and taps remain sharp after prolonged use and are more economical than standard tools.

As is true with any tapped connection, maximum strength is obtained by engaging the greatest possible number of threads of the corporation stop in the pipe wall. With Transite Pipe, this means that after the pipe wall has been properly drilled and tapped and the corporation stop fully inserted, from one to three threads of the stop will show.



The correct final position of a corporation stop in the wall of Transite Pressure Pipe is shown here. The pipe should be drilled and tapped to a depth which will permit from one to three threads of the stop to show.

Transite Pressure Pipe is readily tapped with standard tapping equipment. Here the combination drill and tap is about to be inserted in the tapping machine.

Additional engineering data relating to service connections will appear in a future advertisement in this series. For further information, address Johns-Manville, Box 290, New York 16, N. Y.

*Reg. U. S. Pat. Off.

JOHNS-MANVILLE JM PRODUCTS

I stopped to shoot the breeze for a moment, were talking about how long it takes to get deliveries of materials. Rol Simpson, San. Engr., Gilbert Associates, Reading, Penna., asked point blank of Carlton (Chain Belt) Lind how long it would take to obtain some drive belts. And Carlton asked in return, "Would you settle for a name plate in 14 months?" —If we don't get some allocation system before long, that remark may not be kidding.

* * *

I Collect Nicknames.—Really—Not only have I had no less than half a dozen tacked on me, but I like to pick up the stories behind nicknames. That's my real collection and I have been persuaded to give a talk on "What's in a Nickname?"—Pardon the plug.

One of the names in my collection is "Smoke". I asked Russ (W & T) Clement how he got that nickname. "Simple", said Russ. "As a young fellow, I always had a pipe in my teeth." Haven't changed have you, Russ?

Another favorite—Buffalo Bodie—. It was a sand lot baseball game when Buffalo Bodie made a play that was something to behold, and some spectator remarked, "Just like Ping Bodie" (one of baseball's great of the day). Anyway, from then on Charles G. Ketcham, whose father was long-time superintendent of the Buffalo, N. Y. water works, was "Bodie".

And then there is L. E. (Tack) Langdon of P.F.T. His older brother, Paul (now of Greeley and Hansen, Engrs.) was tall and skinny and hence called "Spike"—but L. E. was too small to be any more than a "Little Spike"—or a "Tack".

It's an inexpensive and fascinating hobby and collection and I'd like to add your nickname to it, if it has a story.

* * *

During the few minutes snatched from duty at the annual meeting of the N.Y.S.S.W.A. in New York, in January, I had a chat with Dick Gorman of the N. Y. State Dept. of Health, "Bill" Gyatt of the Syracuse Sewage Works, and Uhl T. Mann of the Syracuse Ley Creek Plant. The conversation drifted to sludge disposal; the old Syracuse plant, you know, pumps its raw sludge away to be mixed with the lime slurry waste from the Solvay chemical plant. It's been going on for years and the sludge is completely lost in the mountains of waste piled near the chemical plant.

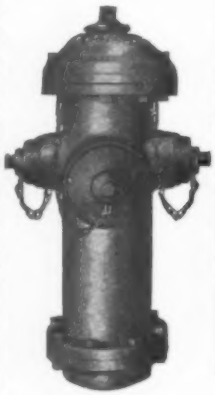
Lately, there's been a movement afoot to modernize the Syracuse treatment plant. At a council meeting this program was being discussed, and some one remarked that Syracuse has a unique system of sludge disposal. Whereupon, one participant in the discussion leaped to his feet and said, "'UNIQUE', is right, and if I remember my Latin, **UNI** means One, and **NIQUE** means Horse—And this certainly is a One-Horse method of sludge disposal."

* * *

When it comes to practicing public relations, I take my hat off to R. C. Willson, Supt. of Water at Hagerstown, Md. When it was deemed necessary to use copper sulfate for algae control, Willson put a notice in his paper, to advise fish owners. And what do you think one of his customers called up to ask?—"How much water does a canary drink and will the water hurt him?"

* * *

And while we are on the subject of public relations, I think you ought to know that Clarence Keefer of the Baltimore Sewage Works, has a mighty neat way of bolstering the morale of sewage plant operators. Clarence just reminds them that they should not let the public look down



TWO
"WORK HORSES"

THE BEST TEAM
For The Long Pull

RENSSELAER Gate Valves and Fire Hydrants: the *reliable* team to which you may confidently hitch your Water Works "wagon."

What other "team" has received such universal approval from coast to coast? Obviously it has become an accepted fact that "It Pays to Buy the *Best.*"

RENSSELAER VALVE CO.

Ask the man who uses Rensselaer!

TROY, N. Y.

Helping hand for Pumping Stations . . . the complete CRANE Line

NUMBER ONE utility in town or city. Guardian of public health . . . foundation for community growth and development. That's the role of a modern waterworks . . . an exacting task for its piping equipment.

To do their job best, wise waterworks officials turn to an old helping hand: the complete Crane line of dependable piping materials. In valves as in fittings for every need, Crane Quality meets today's highest standards for water supply and distribution practices. Crane equipment in its pumping stations and streets means peace of mind and sound investment for a community of any size.

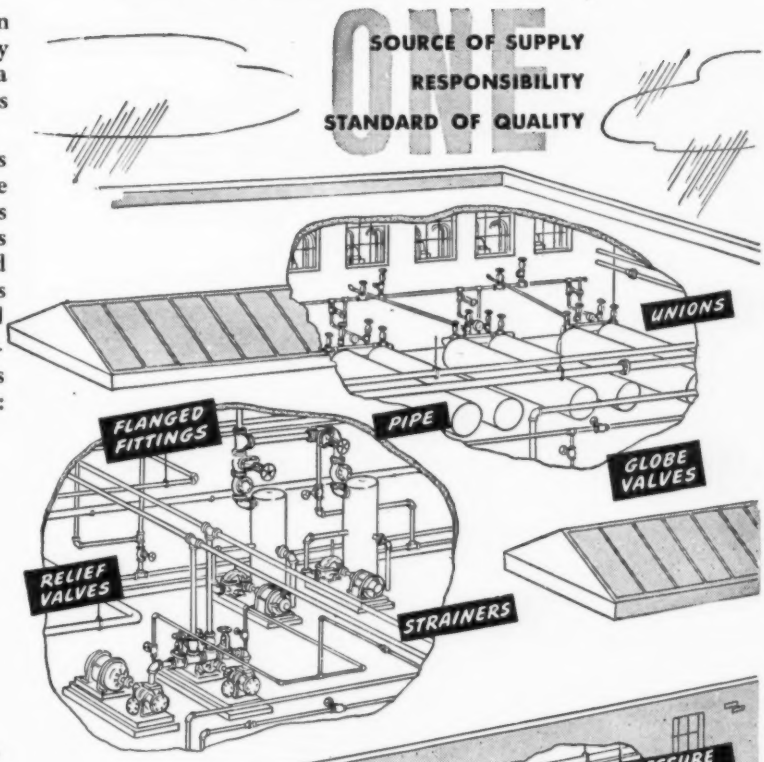
For, to equip with Crane wherever piping is used, is to gain this important 3-way advantage:

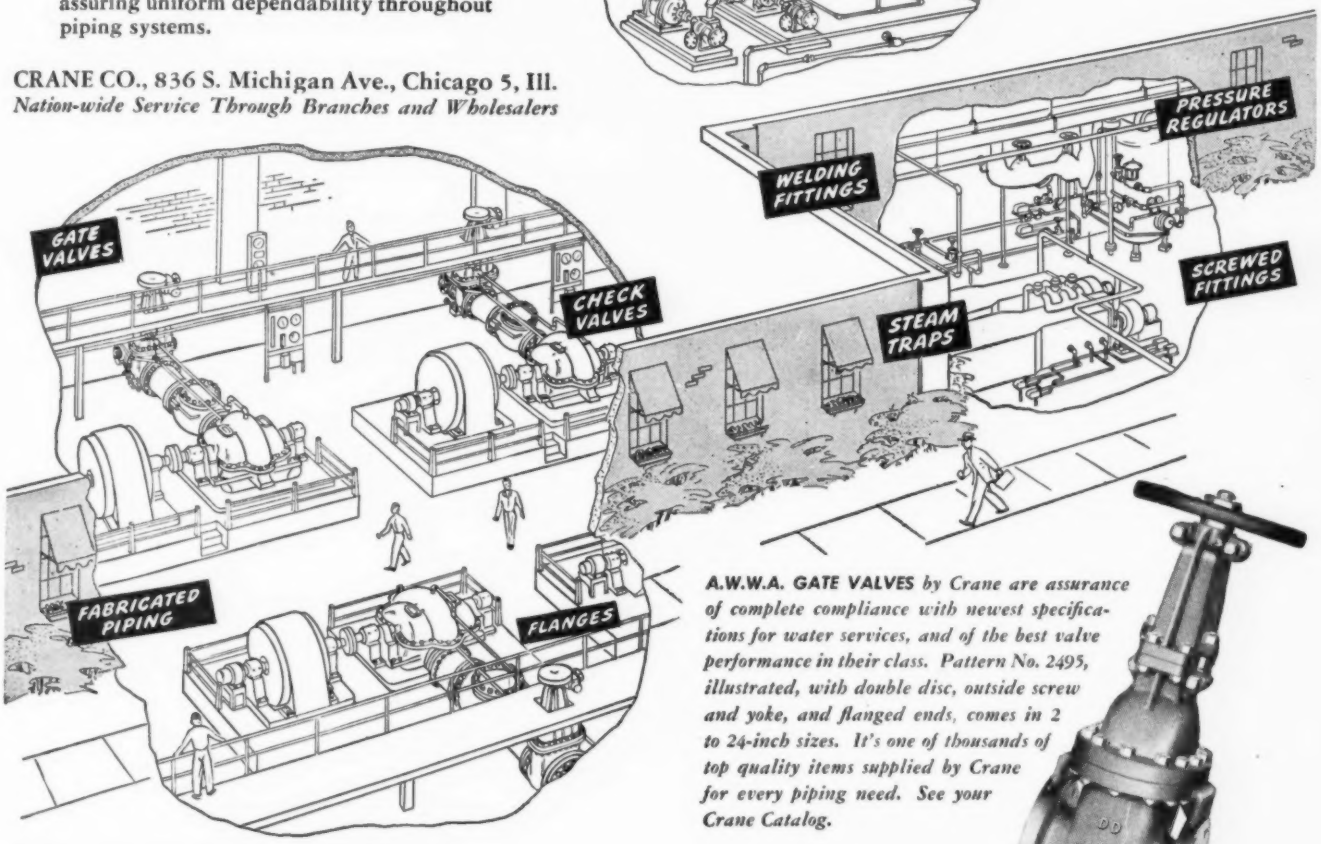
ONE SOURCE OF SUPPLY offering the most comprehensive selection of brass, iron, steel, and alloy piping materials for all power, process, and general services.

ONE RESPONSIBILITY helping you to get the best installation, and to avoid needless delays on the job.

ONE STANDARD OF QUALITY in every item, assuring uniform dependability throughout piping systems.

CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.
Nation-wide Service Through Branches and Wholesalers





A.W.W.A. GATE VALVES *by Crane are assurance of complete compliance with newest specifications for water services, and of the best valve performance in their class. Pattern No. 2495, illustrated, with double disc, outside screw and yoke, and flanged ends, comes in 2 to 24-inch sizes. It's one of thousands of top quality items supplied by Crane for every piping need. See your Crane Catalog.*

EVERYTHING FROM . . .

VALVES • FITTINGS
PIPE • PLUMBING
AND HEATING

CRANE

FOR EVERY PIPING SYSTEM

on their profession. "After all, sewage plant operators have connections with all of the best families in town."

* * *

Since I promised not to publish my own picture again this year, I'll have to refer you to the April issue of the Canadian Magazine *Engineering & Contract Record* (Jim Daly, Editor) for a picture of me working before the Canadian Section Dinner session early in April at Niagara Falls, Ont.

I've performed for some mighty fine audiences in the past 15 years but that Canadian audience was the most wonderful I've ever worked for —**THEY** laughed at my jokes.

* * *

Speaking of wonderful audiences, I was awfully sorry to have to miss the opportunity to work before the Indiana Section at its April meeting. I owe a lot to that group; they gave me my first real opportunity to break away from technical presentations and do something in the lighter vein. Thanks, Hoosiers.

* * *

Mention of Indiana, reminds me that in the April issue of this column, there appeared a Guess What that involved the late Cecil Calvert, Supt. of Purification, Indianapolis Water Co. It was intended as a surprise for Cecil (C.K.) and John Kleinhenz (J.E.K.) who did not know I had it. Unfortunately, the April issue did not come off the presses until about a week after C.K. had passed on quite suddenly.—And up in Canada a week before he died I had been talking to A.E. (W&T) Griffin and Charlie (N.Y. Health Dept.) Cox about what a hard worker Cecil was. Little more than a week later he was gone. It's a shame we don't think to pass out compliments while a person is around to know that he is appreciated. I am but one of a great, great many who will miss C. K. Calvert.

* * *

GUESS WHAT!!

A prize to him (or her) who first tells what this is. And another prize to the one who knows where it is.

* * *

The Winnah!—March Issue Guess Who—"Dear Doc; I wish all contests were as easy as yours. The answer is very simple, in fact so simple I didn't think you were serious. The answer—Ivan MAXWELL Glace and Everette MAXWELL Jones (Casey to you). Please understand I'm not saying the individuals are simple* even if one is Simplex himself. (*I have much better names for both of them) Yours, 'Sig' Sigworth."

The prize will be delivered at the A.W.W.A. Convention in Atlantic City. (This is being written on Apr. 24.)

* * *

I Like Conventions Because—One meets such charming people—like f'rinstance—"Corley (Mrs. V. Porter) Enloe and Elsie (Bill Weir's

Abandoned by the original contractor as impossible to clean because of an unusual amount of bends, "Ts", angles and valves in a 6" line in service at Fort H. G. Wright, Fisher's Island, N. Y., the same line was successfully cleaned by the National Water Main Cleaning Co.

The more than 40 years of technical skill and experience that enabled National to succeed where others failed, is available for cleaning your water mains.

Ask us for an estimate based on restoring your line to at least 95% of its original capacity.

24

NATIONAL WATER MAIN CLEANING COMPANY

50 CHURCH STREET, NEW YORK 7, N. Y.

ATLANTA	1221 Mortgage Guarantee Building	ST. LOUIS	7103 Dale Avenue
BOSTON	115 Peterboro Street	SALT LAKE CITY	149-151 W. Second So. St.
CHICAGO	205 West Wacker Drive	SAN FRANCISCO	681 Market Street
HOUSTON	2518 Grant Street	MONTREAL	2028 Union Avenue
KANSAS CITY	421 BMA Building	VANCOUVER, B. C.	505 West 1st Avenue
LOS ANGELES	448 South Hill Street	WACO	P. O. Box 887
MEMPHIS	822 Dermon Building	WINNIPEG	576 Wall Street
OMAHA	3812 Castellar Street	HAVANA - MAYAGUEZ, PUERTO RICO - BOGOTA	
RICHMOND	210 East Franklin Street	CARACAS	MEXICO CITY

Advertisement

May, 1948

R-S valvEvents

Issued Periodically by R-S Products Corporation, Philadelphia 44, Pa., for Those Concerned with Flow Control and Shut-Off

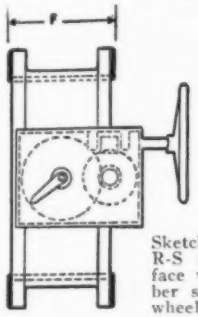
R-S SHOWS NEW VALVE IN NARROW FACE–TO–FACE SIZE

Drawing shows elevation of new R-S Valve for water service in narrow face-to-face size. It is built for 50-pound and 125-pound pressures.

This valve is made for rugged hydraulic service with a large safety factor for line stresses, water-hammer and other normal abuses.

Face-to-face dimensions follow for various available sizes:

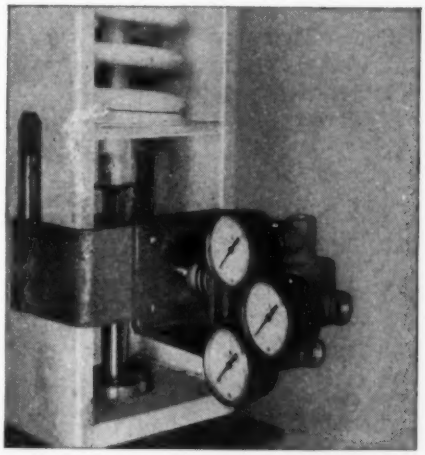
Valve Size	*F*	*Valve Size*	*F*
20″	8″	48″	15″
24″	8″	54″	15″
30″	12″	60″	15″
36″	12″	72″	18″
42″	12″	Larger sizes on request	



Sketch shows new R-S narrow face-to-face valve with rubber spool and hand-wheel control.

The face-to-face dimension includes thickness of the rubber spool with which this valve is normally provided to insure drop-tight shut-off. The valve may be had with metal-to-metal seat if preferred, in which case the face-to-face dimension is ½″ less than the figures quoted above. Because of the narrow face-to-face of this unit it is necessary to drill and tap the 4 bolt-holes on each flange that straddle the center-line of the shaft.

Sketch shows only hand wheel control but the usual hand lever, chain wheel, and chain lever controls are available, too, as well as automatic controls of many types.



Photograph showing control of R-S Valve with Hopkins Cam Positioner

The field of use of the disc type valve, with its lower cost, and capacity of two or three times that of some conventional valves, is thereby greatly widened.

New R-S Valve Representatives . . .

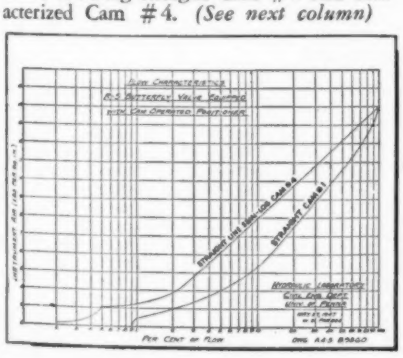
Hardly a month passes without an appointment to the growing list of R-S Valve representation throughout the States and other countries.

This month we announce new representatives in:

El Paso, Texas
Steel & Engineering Products Company
Mills Building, El Paso, Texas
Telephone Main 1770
William W. Small is in charge of this office, covering western Texas.

Toronto, Ontario
Canadian Piping & Refinery Specialties, Ltd.
2498 Yonge Street, Toronto 12, Ontario, Canada
L. T. Brodie is in charge.

Graph shows flow characteristics of R-S Valve utilizing straight Cam #1 and characterized Cam #4. *(See next column)*



R-S Announces New Cam Operated Valve Positioner

A cam-operated positioner is a key feature of a new diaphragm motor valve of the disc or butterfly type just announced by R-S Products Corporation. Excellent control of flow characteristics is attainable by simply changing cams in the field on the cam-operated positioner, which, in effect, adds to the normal functions of the disc type valve. The desirable characteristics of a straight line semi-log curve, linear, or almost any other special characteristics to suit individual process requirements, are within the range of the new positioner.

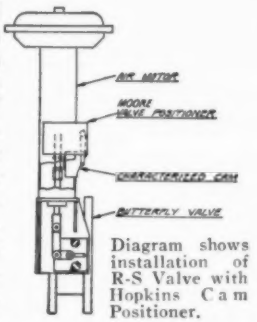


Diagram shows installation of R-S Valve with Hopkins Cam Positioner.

Replacing of one cam on the positioner with another of a different shape permits the retention of the basic advantages of the disc type valve while adding special flow characteristics typical of other valve types. Air motor shown in sketch above utilizes up to 50 p.s.i. operating air pressure. Valve positioner utilizes 0 to 15 p.s.i. instrument air. The cam-operated positioner is also available using hydraulic or air cylinder instead of air diaphragm motor. *(Continued in next column)*

An Oft-told Tale!

"Occasionally," says Russell C. Ayers, Sales Manager of the R-S Valve Division, "we note valve and fitting suppliers advertising magnesium and aluminum castings as if they were a discovery."

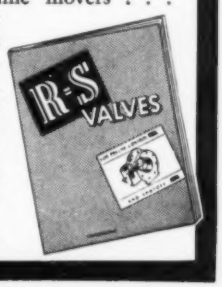
"The fact is that these metals are not novelties in valve manufacture. R-S has been making valves of magnesium, aluminum, and other light metals, and many alloys for a great many years."

"Further, we make our valves of any material that can be cast or welded, even including plastics for certain purposes."

The New R-S Valve Catalog #17

R-S Valve Catalog #17 is packed with information for engineers. There are over 70 halftone pictures of R-S Valves . . . working drawings of 21 types of R-S Valves with standard controls and fittings and complete dimensional data for all sizes . . . working drawings of 22 types of prime movers . . . numerous other diagrams, graphs and miscellaneous drawings. Address R-S Products Corporation, Valve Division, Philadelphia 44, Pennsylvania.

JMLco P-EE2

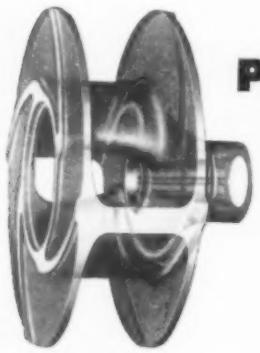


Secy.) Westerman in Atlanta, Ga. (Did I Tell you that it was "Corley" who gave me a Stone Mountain Commemorative Half Dollar for my coin collection?—There are several others I need, hint hint.) Add charming persons—Arline (Mrs. Lou) Smith of the Rochester Water Works Smiths; Sybil Hutchings (Erie, Pa.) whose husband sells Hays water works service items; Mary (Mrs. Jimmy) Robinson, of Hornell, N.Y. and the Rensselaer Valve and Bondo Co.'s; Lucille (Mrs. Charlie McWane Pipe) Cox and the wives of Bert (A. E.) Berry's Ontario Ministry of Health Staff, who are such excellent dancing teachers, —whether one dances with them or not.

* * *

News Note:—This columnist is planning a little vacation, come the July issue, and the column for that month will be guest written by the members (and their wives) of the Ancient and Honorable Order of Sewer Rats of Ontario, Can.—V.T.Y. Doc.

MANUFACTURERS' and EQUIPMENT NEWS



PEERLESS *Non-Clog* IMPELLERS KEEP SOLIDS MOVING...

NO RINGS TO CLOG – NO SEALS TO BIND

The improved Peerless Impeller, shown at left, has unique repelling vanes on both the outer shrouds, and scientifically designed working vanes of uniform thickness to assure *non-clog* pumping action. Peerless *Non-Clog* Sewage Pumps offer a dependable means of pumping entrained solids.

PEERLESS NON-CLOG SEWAGE PUMPS

Type NCH
Horizontal Type
For dry basin installation

Type NCV
Capacities: up to 7000 g.p.m.
Heads: up to 70 feet

A departure from the conventional construction of sewage pumps has resulted in an advanced design that has proved Peerless Sewage Pumps to be non-clogging in action as well as in name. All wearing rings, end plates, filler rings, etc., have been eliminated, and recirculation losses minimized. These pumps are designed for dry basin installation and are available in both horizontal and vertical types, for all types of drive, up to 100 h.p. For a minimum of down time and a maximum of clog-free service, specify Peerless *Non-Clog* Sewage Pumps.

Request Bulletin. All Peerless improvements and advantages in non-clog sewage pump design are described in this new bulletin. Write for No. B-154.

fmc PEERLESS PUMPS

PEERLESS PUMP DIVISION
Food Machinery Corporation

Factories: Los Angeles 31, Calif.; Quincy, Ill.; Indianapolis, Ind.

District Offices: Chicago 40, 4554 No. Broadway; New York 5, 37 Wall Street; Atlanta Office: Rutland Bldg., Decatur, Georgia; Dallas 1, Texas; Fresno, California, Los Angeles 31, California; *Distributors in all Principal Cities*

New Englander Elected President of A.C.P.A.

At the recent annual meeting of the American Concrete Pipe Association, held in New Orleans, J. A. Dunn, President of Hume Pipe of New England at Swampscott, Mass., was elected president of the Pipe Association.

In the above picture Mr. Dunn, on right, is being congratulated by retiring president of A.C.P.A., Elmer L. Johnson, President of the Concrete Conduit Co. of Colton, Calif., who retires after serving two terms as president of this national group of concrete pipe manufacturers.

Permutit's 35th Anniversary

The Permutit Company has announced commemoration of 35 years of service to users of water everywhere. Beginning as a small concern in 1913, the company now has a complete line of water conditioning equipment and accessories to condition any water supply to desired requirements.

The Permutit Company is located at 330 W. 42nd St., New York, and was organized March 24, 1913.

DIXIE TANK AND BRIDGE CO.

3523 LAMAR AVE.—P. O. BOX 14, MEMPHIS 1, TENNESSEE

THE SILENT WATCHMAN

REPRESENTATIVES IN THE FOLLOWING CITIES:

SALT LAKE, UTAH Box No. 1202
DETROIT, MICH. Box No. 1423
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SYRACUSE, N. Y. Box No. 681
BUTTE, MONTANA Box No. 383
GREENVILLE, S. C. Box No. 1074
TAMPA, FLORIDA Box No. 1642
RICHMOND, VA. Box No. 886
NEWARK, OHIO Box No. 623
FARGO, N. D. Box No. 1472
COLUMBIA, S. C. Box No. 472
DALLAS, TEXAS Box No. 1881
DENVER, COLO. Box No. 2037
WAUSAU, WIS. Box No. 682
SAN FRANCISCO, CAL. Box No. 1445
COLUMBIA, MO. Box No. 522
SPOKANE, WASH. Box No. 906
MACON, GEORGIA Box No. 402
PROVIDENCE, R. I. Box No. 202

Complete Service for Elevated Water Tanks—

30 Years Experience

BE SAFE DON'T GAMBLE!

KEEP THE SAFETY FACTOR IN YOUR TANK THE DIXIE WAY

By welding seams, pits and rivets which gives a riveted tank 15% more Safety Factor than it had when built. No rivets removed, water supply maintained while work is in progress.

On completely re-conditioned jobs, the painting is guaranteed for five years, repairs guaranteed for ten years, provided the tank is painted every five years. Yearly inspection, making all adjustments, if any, without additional cost.

Write Us for Free Copy of Publication

SOUND PRINCIPLES OF WATER TANK MAINTENANCE and TANK TALK, by W. A. RILEY

—SAFETY—SERVICE—SATISFACTION—

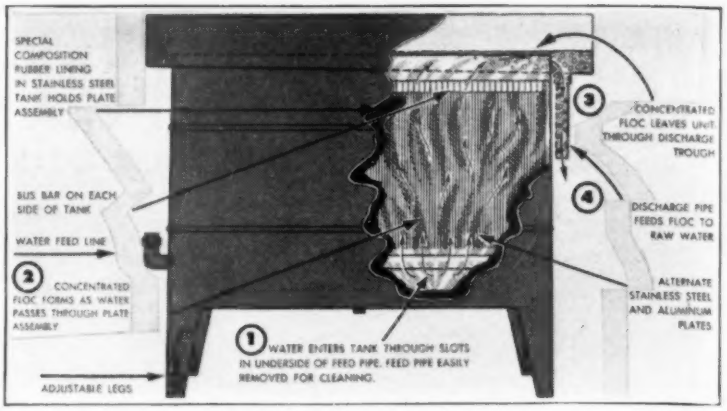
COPYRIGHT, 1947

THE LARGEST ORGANIZATION OF ITS KIND GIVING SAFE MAINTENANCE AT LOW COST

500

Electrolytic Floc Producer

The Alhydro Floc Producer operates on the principle of the electrolytic dissolution of aluminum in water to form a concentrated aluminum hydroxide floc. This new unit is now adaptable to water treatment plants of any capacity and uses aluminum and electric current at low voltage. The sacrificial plates are of aluminum and the other plates are of stainless steel. The plate assembly is enclosed in a stainless steel tank through which a controlled flow of water is maintained. The aluminum plates serve as the anode, the aluminum particles being released as the current passes through.


SPECIAL COMPOSITION RUBBER LINING IN STAINLESS STEEL TANK HOLDS PLATE ASSEMBLY
BUS BAR ON EACH SIDE OF TANK
WATER FEED LINE
2 CONCENTRATED FLOC FORMS AS WATER PASSES THROUGH PLATE ASSEMBLY
ADJUSTABLE LEGS
3 CONCENTRATED FLOC LEAVES UNIT THROUGH DISCHARGE TROUGH
4 DISCHARGE PIPE FEEDS FLOC TO RAW WATER
ALTERNATE STAINLESS STEEL AND ALUMINUM PLATES
1 WATER ENTERS TANK THROUGH SLOTS IN UNDERSIDE OF FEED PIPE. FEED PIPE EASILY REMOVED FOR CLEANING.

Alhydro Floc Producer

In this new design of electrolytic floc producer by the Alhydro Co., 516 N. Charles St., Baltimore, Md., the floc rises to the top and is carried off by means of a discharge trough and discharge pipe to the point where it is introduced into the raw water stream to be treated. The Alhydro floc producer consumes only 68 lbs. of aluminum to do the work of nearly three-quarters of a ton of other coagulants.

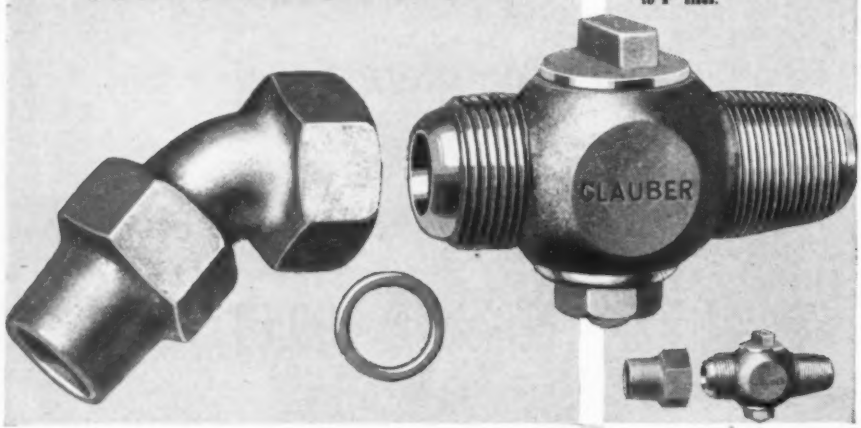
Further information is available on this new unit and may be obtained by entering the above key number on a Reader Service Card.

FOR PERMANENCE INSTALL

Glauber

CORPORATION STOPS

K-1402 below—Standard inlet corporation stop with copper outlet service pipe, ½ bend coupling and gasket. ½" to 2" sizes.



When water services are expanded or new ones installed, water works superintendents and engineers provide their community with a plus value of SERVICE when Glauber ground key work is specified. Not only will they last the lifetime of the installation of which they are a part, but they retain their original easy operation without leaking or freezing. A new catalog describing the complete line of Glauber water works fittings is yours for the asking. Yes, deliveries can be made on most patterns to meet your construction schedules.

K-1400 above—Straight coupling corporation stop with copper outlet service pipe. ½" to 2" sizes.

K-1404 above—¼ bend coupling corporation stop with copper outlet service pipe. ½" to 2" sizes.

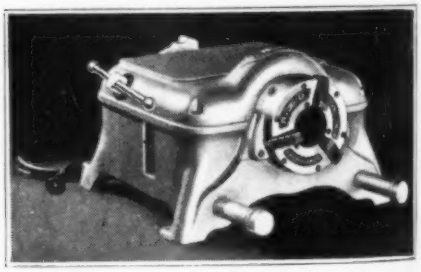
THE Glauber BRASS MFG. CO., KINSMAN, O.
Division of H. B. SALTER MFG. CO., Marysville, Ohio

Glauber RED BRASS
GROUND-KEY CURB and CORPORATION STOPS
LEAD GOOSENECKS and WATERWORKS FITTINGS

501

Power Drive for Pipe Cutters

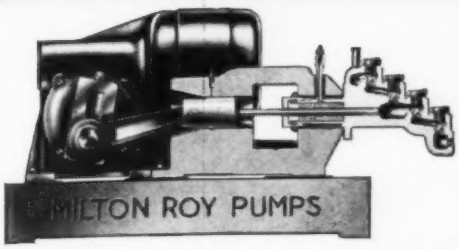
The Ridge Tool Co., Elyria, O., has announced the development of a new power drive for operating hand pipe cutters, threaders, and reamers. This



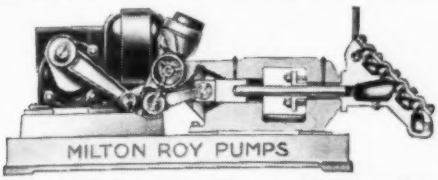
new unit is named the Ridgid Porta-Power Drive, weighs but 100 pounds and is the lightest machine ever offered to the trade.

The Porta-Power Drive plugs into any 110 a.c. light socket. The unit stands 19¼ x 18 x 12 in. high, and capacity is from ⅛ to 2 in. pipe and up to 8 in. pipe when used with the Ridgid universal drive shaft.

Further information about this new unit may be obtained by entering the above key number on a Reader Service Card.



Stroke Adjustment—Screw. Liquid End—Alloy.



Stroke Adjustment—Micro while running.
Liquid End—Cast Iron, cover plate design.

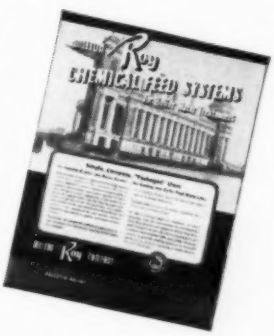
MILTON Roy CHEMICAL PUMPS

For Accurate Control of Volume

Milton Roy Pumps are positive metering units for controlled volume pumping in which the length of the plunger stroke is quickly and easily adjusted to regulate the volume of liquid pumped. Precise control in pumping small volumes is thus made possible, down to as little as 1 pint per hour.

Milton Roy Pumps are now available with completely automatic electronic volume controls by means of which any changes in metered main-line flows will cause immediate proportional changes in the chemical flow delivered by the pumps. Many such installations are in successful operation, treating municipal and industrial water and waste.

Liquid ends of Milton Roy Pumps are supplied in any metal or alloy that can be cast and machined, also in certain plastics materials, to meet practically all corrosion resistance requirements.



Ask for Catalog No. 146 and Technical Paper 54 "Electronics in Automatic Chemical Feed Systems".

MILTON Roy COMPANY
1329 E. MERMAID LANE CHESTNUT HILL, PHILA. 18, PA.

Use Hooker Chlorine for Effluent Sterilization

CHLORINATION of effluent is rapidly becoming standard practice in many sewage treatment plants. Not only does the chlorination of the effluent reduce the bacteria count, but tests indicate that by chlorinating sufficiently to maintain a residual of from 0.5 to 1.5 ppm a pronounced improvement was effected in the quality of the body of water into which the effluent was discharged.*

If you are planning on using chlorine in your sewage treatment, you can insure consistently uniform results by specifying Hooker Chlorine.

Because users know that they can depend on Hooker for uniform high quality, Hooker Liquid Chlorine is being specified by many sewage treatment plants and is the favorite there, as it has been among water works officials since Hooker first produced Chlorine over forty years ago.

Hooker's Technical Staff, with a background of experience that started with early commercial production of chlorine is at your service in solving your problems involving chlorine, and the other Hooker Chemicals.

"Hooker Liquid Chlorine" is a booklet which contains helpful information on this chemical and includes sections on materials for equipment, precautions, physical and chemical data and useful tables. Every water works and sewage official should have a copy. Available free when requested on your letterhead.

*"Results of Effluent Chlorination at Cleveland." Water Works and Sewerage, Aug., 1944, page 300.

HOOKER
ELECTROCHEMICAL
COMPANY

Buffalo Ave. and Ward St.
NIAGARA FALLS, NEW YORK

NEW YORK, N. Y. TACOMA, WASH.
WILMINGTON, CALIF.

HOOKER
CHEMICALS

Chlorine

Caustic Soda

Muriatic Acid

Mathieson Changes Name, Elects New Pres.

The Board of Directors of Mathieson Alkali Works changed the name at the end of March to the Mathieson Chemical Corporation.

The company, which was established in 1892, has expanded its service to industry with many other chemicals besides alkali and the new name is expected to reflect more accurately the company's products.

Elected as president at the recent meeting of the Board of Directors was Thomas S. Nichols, formerly vice president of the Prior Chemical Co. Mr. Nichols will serve as president and chief executive officer, replacing George W. Dolan, formerly president, who was elected chairman of the board. Mr. Dolan succeeds A. U. Fox, who resigned.

Ford's Photo Prize Contest

The Ford Meter Box Co., Inc. have announced a photo prize contest.

In preparation for their next catalog they desire a number of photographs showing their products being installed or in actual service in the field. For every photo that they can use, they will present an attractive leather billfold and a check for $5.00, and an additional $10.00 for the best picture of each of a number of categories. In addition, there will be a grand prize of $50.00 for the best picture sent in during the contest.

The contest closes at the end of May. Prizes will be issued within two weeks thereafter.

W&T Appoints Two New Managers

Safford to Albany
Griffith to Syracuse

The Wallace & Tiernan Co. has announced the appointment of M .A. (Sandy) Safford as district manager for the Albany, N.Y. district. At the same time F. B. (Red) Griffith has been appointed district manager in

"Red" Griffith

"Sandy" Safford

Syracuse. This is the first time that the Syracuse office has been rated as a district. Heretofore this office was served out of Albany under the management of L. J. Peck, who resigned recently to go into business for himself.

Mr. Safford has been in the Pittsburgh office of W&T with Earle Johnson for a number of years. Mr. Griffith, who returned to N.Y. State during the last few years, has spent a number of years in Texas.

PEOPLE TAKE SEWAGE DISPOSAL FOR GRANTED,
But.....
THE HEALTH AND SAFETY OF A COMMUNITY IS DEPENDENT ON EFFICIENT OPERATION OF ITS SEWAGE PLANT.

If you had to divert sewage gathering because of fire or explosion in the plant, you can readily imagine the catastrophic results. The best insurance is proper fire prevention. With inflammable sewage gases, this means adequate and dependable safety devices that are designed to prevent flame propagation and explosion. Each of the "VAREC" Approved Safety Devices shown below has a definite place in your plant. Whether you are designing a new sewage treatment plant or surveying an old one for fire hazards, insist that dependable "VAREC" Safety Devices be used.

FIGURE 440 "VAREC" *Approved* PRESSURE RELIEF AND FLAME TRAP ASSEMBLY
Usually installed in waste-gas line, just upstream of Waste-Gas Burner.

FIGURE 450 "VAREC" *Approved* FLAME TRAP ASSEMBLY
Usually installed in all gas lines supplying gas utilization equipment and in line to gas holder and between multiple digesters.

FIGURE 50A "VAREC" *Approved* FLAME ARRESTOR
Usually installed between digester dome and Pressure-Vacuum Breaker Valve.

FIGURE 70 "VAREC" *Approved* EXPLOSION RELIEF VALVE
Usually installed at top of vertical riser upstream of any source of combustion. Can also be used as an auxiliary pressure relief on digester and gas holder domes.

All "VAREC" Sewage Equipment is fully described in the "VAREC" S-3 Catalog. Write for your copy today.

OTHER "VAREC" *Approved* SEWAGE GAS CONTROL EQUIPMENT
Pressure Relief and Vacuum Breaker Valves—Pressure Reducing Regulators—Back Pressure Regulators—Flame Checks—Waste Gas Burners—Manometers—Sediment Traps—Drip Trap Assemblies.

S-1

"Varec" THE VAPOR RECOVERY SYSTEMS COMPANY
COMPTON, CALIFORNIA, U.S.A.
NEW YORK 30 Church Street · CLEVELAND 1501 Euclid Ave. · CHICAGO 122 So. Michigan Ave. · TULSA 533 Mayo Building · HOUSTON 821A M. & M. Bldg.
Available from Authorized Sewage Equipment Agents throughout U. S. and Canada
Cable: VAREC COMPTON (all codes)

502

Curb and Valve Box Cleaner

Joseph G. Pollard Co., Inc., 142 Ashland Place, Brooklyn 1, N.Y., is offering a curb and valve box cleaner. This new unit was designed by a waterworks man and is strong, durable, and light in weight. It is useful in 2½ in. curb boxes and all size valve boxes. Blades are forged, will stand hard usage, and will pick up stones, rubbish, and dirt from both valve boxes and curb boxes. It may be obtained in lengths of five ft. or six ft.

For further information, mail a Reader Service Card containing the above key number and your name and address.

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READER SERVICE CARDS for

WATER & SEWAGE WORKS

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Information — Literature

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LATEST
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155 East 44th Street
New York 17, N. Y.

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New York 17, N. Y.

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WATER & SEWAGE WORKS READER SERVICE

READER SERVICE CARDS HOW TO USE THEM

Please fill out a separate coupon for each item on which you desire information. This will greatly facilitate handling.

Key number is at head of each new product, item of equipment, catalog or bulletin, described in this issue.

Enter key number in box.

Please PRINT your name and title, company or department name, and your address

NOTE—

These cards are to be used only for items described in THIS ISSUE

WATER & SEWAGE WORKS

Will see that you receive information desired.

WEEDS are OUT at water works installations

Dolge SS Weed Killer can be used to advantage in all areas containing water works installations, where no vegetation whatever is desired. Sprinkled on, in economical dilution, this formula works down to the roots, so that it destroys not only surface growth but the entire vegetable structure . . . particularly important where stand pipe locations must be considered. Keeps the growth down around high reservoirs; with proper application there is no danger that the solution will work into storage facilities.

E.W.T. Selective Weed-Killer

(2-4-D) maintains your landscaping but eliminates noxious weeds. Non-injurious to most grasses, E.W.T. aids in keeping a "well-groomed" appearance to the grounds around your pumping plant, purification plant, storage facilities and administration building.

Both DOLGE WEED KILLER and E.W.T. SELECTIVE WEED KILLER have their place in your ground maintenance program. They forestall hours of expensive labor devoted to weeding by "going to the root" of the weed problem.

Complete literature will be sent on request. If you have an unusual weeding problem, we shall be glad to suggest specific methods for dealing with it.

The C. B. DOLGE CO.
WESTPORT, CONNECTICUT

CHEMCO Equipment

FOR
EVERY CHLORINATION
AND
WATER CONDITIONING
PROBLEM

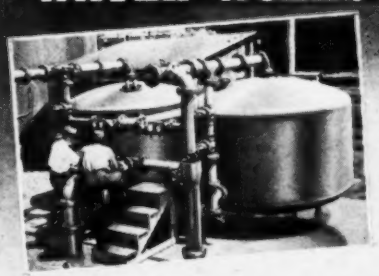
For Your
SEWAGE PLANT

CHEMCO CHLORINATORS are available for every type of installation. The above shows two CHEMCO 100# capacity chlorinator installed for the State of New York. Note use of Aqua-Thermal Coils.

For Your
SWIMMING POOL

CHEMCO has "Everything for the Swimming Pool" from the Filters to the Life Preservers.

For Your
WATER WORKS



A large Chemco-Filter Plant installation for the Santa Fe Railroad, Winslow, Arizona. Consult CHEMCO first for your Chlorinator or Water Conditioning Problem.

CHEMICAL EQUIPMENT CO.
1700 NO. MAIN STREET
P. O. Box 3098 Terminal Annex
Los Angeles 54, Calif.
MIDWEST FACTORY BRANCH
205 W. Wacker Drive Chicago 6, Ill.
AGENTS IN PRINCIPAL CITIES

M H

HYDRANTS and VALVES

Expert workmanship and highest quality materials make M & H products a good investment always. Many years of use in all sections of the country has proved their ruggedness and dependability.

M & H furnishes both regular type A.W.W.A. fire hydrants and special Traffic Model designed to yield at the ground line under impact.

Write for Catalog No. 34

M & H PRODUCTS
Fire Hydrants
Gate Valves
Tapping Valves
Special Castings
Tapping Sleeves
Check Valves
Floor Stands
Extension Stems
Mud Valves
Flap Valves
Sludge Shoes

M & H VALVE
AND FITTINGS COMPANY
ANNISTON, ALABAMA

SPARLING MAIN-LINE METERS

with Wide Flow-Range

INDICATOR—TOTALIZER RECORDERS

THIS instrument (Type 215) operates by electric remote control from any Sparling Meter to furnish instant information on flow-rate in the line, with a 60-day record of all flows ranging from 3% to 100% of capacity!

The totalizer duplicates the one on your meterhead—all vital information just where you need it!

Panel or wall-mounted ,if you prefer.

•

N.B. Sparling Meters for all types and sizes of mains are complete Totalizing units just as you install them.

•

New Catalog-Bulletin 310 comes upon request

R. W. SPARLING
Manufacturers of WATER MEASURING EQUIPMENT

LOS ANGELES 54....Box 3277 Terminal Annex
CHICAGO 16.....3104 South Michigan Ave.
622 Broadway.....CINCINNATI 2
101 Park Avenue.....NEW YORK 17
BOSTON 8.....6 Beacon Street

AMERICAN GAS BOILERS

STEAM AND WATER TYPES

FOR DIGESTER HEATING

American Radiator & Standard Sanitary Corporation, Pittsburgh, Pa.

SALES OFFICES IN PRINCIPAL CITIES

FOR RATINGS AND DATA SEE OUR PAGE IN THE ANNUAL REFERENCE SECTION

AMERICAN-Standard
First in Heating and Plumbing

L. J. Peck Buys Van Nouhuys Supply Co.

L. J. (Larry) Peck of Albany, N.Y., has resigned his position as district manager of Wallace & Tiernan and purchased the Van Nouhuys Pump & Supply Co., located in that

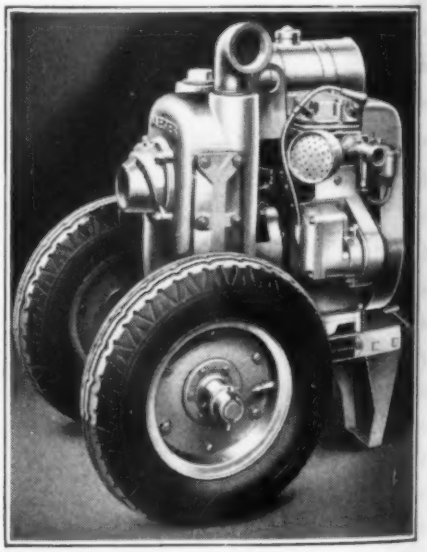
city. The latter firm has been supplying Yeomans and Peerless pumps among others.

Mr. Peck has a wide following of friends in Albany, New York State and New England.

503

Jaeger High Pressure Pump

Jaeger Machine Co. of Columbus, Ohio, has introduced a new two-inch portable pressure pump, Model 2PAFH, in answer to a demand for a compact, completely self-contained and easily transported pumping unit.



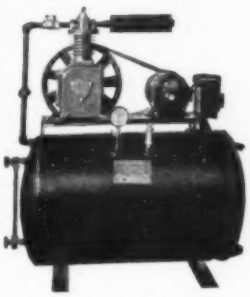
Slightly more than 2 ft. square, the pump weighs only 150 lbs. including pneumatic tires, mounting frame, etc.

At 10 ft. suction lift, this Jaeger pump has a range of volumes and pressures from 135 gpm. at 10 psi., to 30 gpm. at 60 psi., and a maximum shutoff pressure of 70 psi.

For further information on this "Sure-Prime" pump, just fill in a Reader Service Card with the above key number.

APCO-V-APCO PRIMERS

AUTOMATIC POWER OR TANK PRIMERS



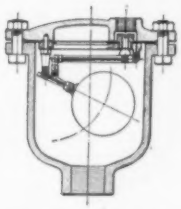
No. 2V-APCO

AIR RELEASE VALVES

FOR

FILTER PIPE LINES—DISTRIBUTION LINES
AND OTHER USES

17 TYPES



No. 200 VALVE

VALVE AND PRIMER CORPORATION 30 W. Washington St., Chicago 2, Ill.

5 GOOD REASONS

for buying Blaw-Knox Grating

. . . COUNT 'EM!

1. STRONG electroforged construction for easy erection.
2. MAXIMUM OPEN AREA for light and air.
3. EASY TO MAINTAIN . . . paint reaches entire surface.
4. SELF-CLEANING, no sharp corners to clog.
5. SAFE footing at all times with twisted cross bar.

BLAW-KNOX DIVISION
of BLAW-KNOX CO.
2051 Farmers Bank Bldg.
Pittsburgh 22, Pa.

BLAW-KNOX ELECTROFORGED STEEL GRATING

LUMETRON

Photoelectric Colorimeter Model 450 for Nessler Tubes

A new photoelectric instrument of high accuracy for the measurement of color and turbidity, as well as for all analytical colorimetric tests in the examination of water and sewage.

- Turbidity tests in terms of APHA (ppm) scale.
- Color tests in terms of APHA (mg Pt) scale.
- Suited for determination of ammonia nitrogen, nitrate, nitrite, and for all other colorimetric tests according to APHA "Standard Methods."
- Operates with all "low form" Nessler tubes 32 mm O.D., 200 mm high. Requires no matched sets of tubes.

LUMETRON Mod. 450 eliminates the uncertainties of visual matching methods. It requires no permanent color standards and furnishes reproducible results independent of individual judgment and of light conditions.

Write for literature to

PHOTOVOLT CORP.
95 Madison Ave. New York 16, N. Y.

Write also for literature on

PHOTOVOLT Line-Operated pH METER

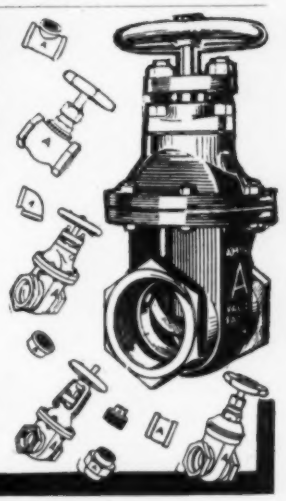
VALVES AND FITTINGS

DEPENDABLE PERFORMANCE SINCE 1901

Iron Body Gate Valves
Iron Body Check Valves
Iron Body O.S.Y. Valves
Iron Comp. Flanges
Iron Flange Unions

"A" TRADE MARK

Brass Pipe Fittings
Brass Gate Valves
Brass Globe Valves
Brass Check Valves
Brass Radiator Valves
Brass Gas Cocks



AMERICAN VALVE MFG. CO. Coxsackie, N. Y.

N. Y. OFFICE & WAREHOUSE: 37-25 32ND ST., LONG ISLAND CITY 1, N. Y.

504
Nu-Type Coatings

The Gregg Co., Inc., 1418 Walnut St., Philadelphia 2, Pa., is marketing a new type of coatings for exposure to chlorine, hydrogen sulphide, sludge, ferric chloride solution, etc.

Known as the Nu-Type paint, the material is offered in a number of distinctive colors and recommended for use on water storage tanks, fire hydrants, concrete sewer pipes (interior and exterior), structural steel, concrete floors, metal floors and gratings, piping, filters (both interior and exterior), digestion tank heating coils, clarifiers, machinery and pumps, side walls, ceilings, etc. Ten different colors are available.

The majority of the coatings manufactured can be made to inhibit the growth of bacteria and fungus deposit and the material is unaffected by atmospheric changes and conditions. Tests of these coatings have been made against a wide variety of acids, alcohols, salts, and miscellaneous chemicals including carbon tetrachloride, gasoline, hydrogen peroxide, turpentine, etc. From the results of these tests, it would appear that this new type coating will be applicable for almost any use in water, sewage works, or industrial waste treatment plants. The accompanying photograph shows special testing dishes in which you can determine the applicability of the coating for the use you desire.

For further information, just enter your name and the above key number on a Reader Service Card and mail.

Consulting Engineers, J. E. Sirrine Company; General Contractors, Diamond Construction Company and Shepherd Construction Company; pipe supplied by Bethlehem Steel Company.

KOPPERS

BITUMASTIC*

PROTECTS THIS 14-MILE

PIPELINE INTO SAVANNAH

THIS 14-MILE PIPELINE will carry 35,000,000 gallons of water daily to the City of Savannah, and to a large paper mill in the area. It passes through swampland where corrosion is the big problem.

To prevent corrosion from these severe conditions, the exterior of the pipe is protected with Koppers Bitumastic 70-B Enamel. For the pipe interior, freedom from corrosion, rust and tuberculation, and continued high flow coefficients are assured by a glass-smooth spun lining of the same impervious coating.

Specify Bitumastic coatings—proven leaders for over 90 years in protecting metal, concrete and masonry. Write for data on your particular problem.

*Reg. Trade Mark, U. S. Pat. Off.

K KOPPERS

KOPPERS COMPANY, INC. DEPARTMENT 518T PITTSBURGH 19, PENNSYLVANIA

505
Sanitation Chemicals Delivered by Air

The Mathieson Chemical Co., which recently introduced packets on sanitation control for flooded communities, has developed a new device for distributing sanitation chemicals to communities isolated by floods. This new item consists of a special winged carton, requiring no parachute and containing chemicals which help prevent flood-borne disease.

A demonstration at the Westchester County Airport, conducted by the company, showed that it could be successfully carried out. Each carton carried six five-pound cans of calcium hypochlorite, enough to purify up to 2½ mil. gal. of drinking water.

The accompanying photograph shows the demonstration of the winged carton of sanitation chemicals being made to the pilot who flew the plane on the experimental drop. The experimental tests were eminently successful. The test was witnessed by repre-

sentatives of the Coast Guard, Disaster Relief Service, American Red Cross, U. S. Public Health Service, Westchester County Dept. of Health, the Air Defense Command, and the N.Y. State Health Department.

Further information on this new item may be obtained by entering the above key number on a Reader Service Card.

H. G. Hoggatt Joins Builders-Pacific Inc.

L. H. Chamberlain, president of Builders-Pacific, Inc., an affiliate of Builders Iron Foundry, has announced the appointment of H. G. (Gene) Hoggatt as sales engineer for the company in the Berkeley office.

Mr. Hoggatt is a graduate of the Univ. of Utah and served as Lieutenant in the Corps of Engineers during the war.

Builders-Pacific, Inc. will have completed its first two years of operation next July. The company represents not only Builders-Providence, Omega Machine, and Proportioneers, but also Aurora Pump Co., Ludlow Valve Mfg. Co., The Pitometer Co., and Walker Process Equipment, Inc.

• PRE-STRESSED "GUNITE" •

The picture shows a partially completed 40' diameter, 110,000 gallon pre-stressed "GUNITE" tank with a "GUNITE" dome roof, designed and built by us.

When this photo was made the tank was filled with water for leakage test. After the test showed the tank to be bottle-tight, two inch mesh reinforced "GUNITE" was placed over the outside to permanently protect the pre-stressed hoop rods. The tank was subsequently covered with earth, with 12" of fill over the dome.

This photo illustrates our method of pre-stressing the hoop rods by means of several turnbuckles in each hoop.

Our Bulletin C2300 describes and illustrates pre-stressed "GUNITE" construction in detail and also scores of other uses of "GUNITE."

Write today for your free copy of Bulletin C2300.

CEMENT GUN COMPANY
"GUNITE" CONTRACTORS
GENERAL OFFICES—ALLENTOWN, PENNA., U.S.A.

FOR SALE

WATER RESERVOIR

ONE MILLION GAL. CAPACITY

INSIDE DIAMETER . . . 80 ft.
Laminated Douglas Fir Staves
3" x 6" x 25'11"

9 Roof Pillars
length 27 ft.
diameter 12 inches

Rafters 14 inch on Center (2"x10")
3 Beams . . . . . 8" x 12"
Roof Sheathing . . . . 1" x 6"

85 Steel Hoops . . (1" diameter)
Each Hoop 11 sections 23' 6¾" long

935 1-inch Lugs

1 Clayton Altitude Valve . . 16"
1 Check Valve . . . . . 16"
1 Shut-Off Valve . . . . . 16"

Complete Plans, Drawings, and Specifications Furnished.

RESERVOIR USED—Condition Comparable to New

FOR SALE AT CAMP ADAIR, CORVALLIS, OREGON

For Information Write

WESTERN ENTERPRISE
Swan Island, Portland 18, Oregon
Tel. WE. 9595

PORTABLE GATE OPERATORS

A

B

C

A. The Gatender. A Portable Gasolene Power Operator
B. The Powerench. Gas Engine Driven Unit for all Gates
C. Truck Mounted for Big Gates Under Pressure

PAYNE DEAN & CO., MADISON, CONN.

Hardinge Appoints Stuart Corp. as Representative

The Hardinge Co., Inc., York, Pa., has announced the appointment of Fred Stuart of the Stuart Corporation, Baltimore, Md., as sales agent for Hardinge products in the Southeastern states. To his own line of materials and equipment Mr. Stuart will add the Hardinge automatic backwash rapid sand filters, clarifiers, and digesters for the municipal and sewage fields.

506

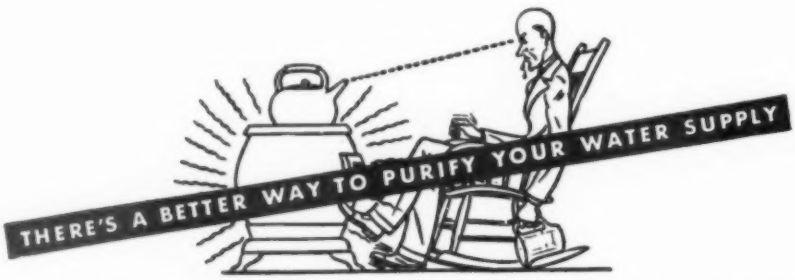
Radio for Checking Water Lines

National Water Main Cleaning Co., 50 Church St., New York 7, N.Y., has available walkie-talkie radio systems for maintaining communication between the point of operation and control valves or pumping stations when tests are being made on water mains or cleaning is being done.

This equipment is not for sale, but is available for use in checking the condition of water mains, determining nature of obstructions, unusual pipe layouts, etc.

If you have a problem involving communication between two distant points on a distribution system, you may be interested in this service and equipment.

Further information may be obtained by entering your name and the above key number on a Reader Service Card.



%PROPORTIONEERS%
HEAVY DUTY CHEM-O-FEEDER

Even if the watched kettle never boils you can have safe, pure water with %Proportioneers% Heavy Duty Chem-O-Feeder. This inexpensive, dependable chemical feeder will automatically purify up to a million gallons of water a day. Cross-connected to the starting switch of the main pump motor, the Chem-O-Feeder operates exactly in step with the pump and sterilizes every drop of water. It feeds just the right amount of hypochlorite or other chemical — eliminates the unpleasant taste resulting from overfeeding, and prevents dangerous undertreatment. Write for Bulletin SAN-2.

ADJUSTMENT WHILE IN MOTION. By simply turning a knob which varies the stroking length, the amount of chemical fed can be precisely adjusted while the pump is operating.
CONTINUOUS FEEDING. Unique stroking arrangement gives long feeding stroke and short suction stroke — provides uniform distribution.
"SEE-THRU" PLASTIC REAGENT HEAD. Safely handles all water treating chemicals — shows the movement of the parts and the flow of liquid being fed.
PROVEN DESIGN. Over 24,000 "Proportioneers"® units are in use all over the world.

% PROPORTIONEERS, INC. %
9N Codding Street, Providence 1, R. I.

Finley to Represent Hydro-Tite in Florida

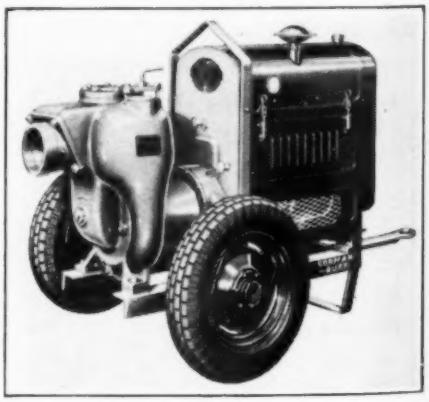
R. F. Hayes, Secy. and Gen. Sales Mgr. of the Hydraulic Development Corp., has announced the appoint-

ment of Thomas R. Finley, who operates Finley's Municipal Supply Co., 1133 W. Church St., Orlando, Fla., to represent the company in the sale of Hydro-Tite and Fibrex in the state of Florida.

Mr. Finley also carries a general line of water works materials.

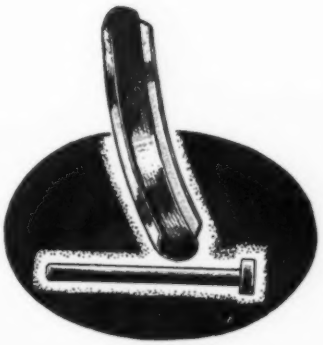
507

Gorman-Rupp Contractors' Pumps



Gorman-Rupp has recently introduced a complete new line of centrifugal, self-priming contractors' pumps. These new pumps have high speed priming at all suction lifts at Contractors' Pump Bureau ratings. For example, the new 15M primes in 61 seconds at 25 ft. suction lift and the new 90M in 44 seconds at 25 ft.

HAVE YOU TRIED
stainless steel
Memphis Slot Inserts
with new
bronze thrust rollers?



PATENTED

SAVE MONEY, LABOR, MEASURING CHAMBERS with this simple device, easily installed, made to fit water meters varying in size from ⅝" to 2". By lining ragged roller slots, the Memphis Slot Insert adds years to the life of measuring chambers and provides remarkable accuracy in water registration.

For free ⅝" samples, send the coupon below to the

METER SPECIALTY CO.
Office: Sterick Bldg.
Factory: 1332 N. Seventh St.
MEMPHIS, TENNESSEE

Please send me free samples of Memphis Slot Inserts to fit ⅝" water meters of the following makes:

.....

.....

Your Name..... Title.....

Company .....

Address .....

.....

For further information on these new Gorman-Rupp contractors' pumps, enter the above key number on a Reader Service Card and mail to this magazine.

Hays Mfg. Co. Appoints Two Representatives

The Hays Manufacturing Co. has appointed two new representatives. John C. McCarthy has been appointed

G. L. Brister

J. C. McCarthy

as New England sales representative and will make his home in that territory.

Gene L. Brister has been appointed sales representative for the South Central territory which includes Maryland Dist. of Columbia, Virginia, North and South Carolina.

How to join more bell and spigot cast iron water mains per hour ...at less cost

ELIMINATE USE OF HIGH PRICED LEAD

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High lead prices needn't bother you anymore. Use Haymanite. It's inexpensive—goes 4 times as far as lead. Saves 75% of costs.

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- Self-sealing if broken.

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INCORPORATED
ESTABLISHED 1869
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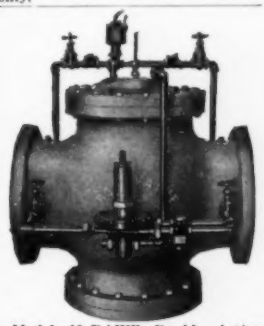
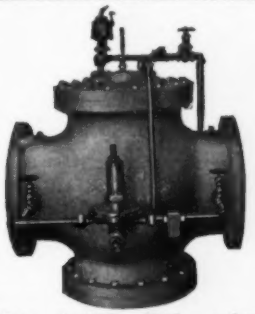
Est. 1879
ROSS
AUTOMATIC VALVES

Altitude Valves for tank and reservoir, with two sets of controls—Automatic Hydraulic and Electric Remote Control. Hydraulic pilot normally operates the valve, while electric pilot is used for emergency only.



Model 40-DAWR Double Acting may be operated by electric pilot regardless of elevation of water in tank or reservoir, for a break in supply or distribution and when fire pressures require direct pumpage.



Model 30-AWR Single acting valve may be controlled in same manner as the Model 40-DAWR.

Model 40-AWR Single Acting semi-throttling valve will close on reversal of flow and the electric pilot would serve only a single purpose—either to open wide or close as emergency may require.

ROSS VALVE MFG. CO.
Incorporated
P.O. BOX 595, TROY, N.Y.

Kennedy Valve President

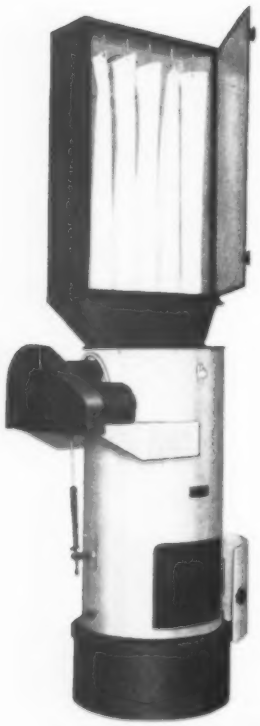
The Kennedy Valve Mfg. Co. of Elmira, N.Y. has announced the election of Charles F. Kennedy as president. Mr. Kennedy has been with the company since graduation from the Univ. of Michigan in 1937, and was made vice-president and works manager in 1947.

Charles F. Kennedy replaced Matthew E. Kennedy who has been president of the company since 1928 and was elected chairman of the Board of Directors.

American Rolling Mill Co. Changes Name

The name of the American Rolling Mill Co. has been officially changed to Armco Steel Corporation.

Not only has the trade name "Armco" been the theme of national advertising since 1914, but the name Armco Steel Corporation is expected to more fully reflect the true nature and scope of the company's business, according to Chares R. Hook, the president.



OMEGA FEEDERS with Dust Collectors

The Omega Dust Collector bags dust before it messes up your plant . . . Installed with the Omega Universal Feeder, the dust collector makes hopper filling and chemical feeding dust-free operations. Dusty air is constantly drawn through close mesh filter bags and the trapped dust falls automatically — without waste — into the feeding hopper below.

The Omega Universal Feeder as shown has feeding mechanism enclosed in a dust proof case, sealed on the mixing chamber. It accurately feeds any dry material — lime, soda ash, alum, carbon, etc. — by volume and handles lumps or powder with equal dependability. Construction rugged and simple. Available in three sizes to feed at exactly the rate desired up to 5,000 lbs. per hr.

Write for Bulletin 1-4

OMEGA PRODUCTS

Volumetric Feeders • Gravimetric Feeders • Solution Feeders
Lime Slaking Equipment • Bucket Elevators • Laboratory Stirrers

OMEGA MACHINE COMPANY
(Division of Builders Iron Foundry)
10 CODDING ST., PROVIDENCE 1, R. I.

LITERATURE AND CATALOGS

508

50th Anniversary

Burns & McDonnell Engineering Co. of Kansas City, Mo., has reached their 50th anniversary of the founding of the company. In commemoration of this event, the company has prepared and released an **Anniversary Booklet.**

The book is amply illustrated not only with pictures of members of the firm and of the founders, but also many photographs of various water, sewage, and electric works which the firm has designed and supervised.

The story of this firm's work is told pictorially with a minimum of manuscript.

If you desire a copy of this book, enter the above key number on a Reader Service Card.

509

Filters for Trade Wastes

The Hardinge Co., Inc., York, Pa., has a 2-page bulletin issued on **The Hardinge Automatic Backwash Rapid Sand Filter for Trade Wastes.**

In addition to showing a cutaway drawing of the filter and its operation, a flow diagram is shown for its use in the treatment of industrial wastes.

A copy of this bulletin may be obtained by entering the above key number on a Reader Service Card and mailing to this magazine.

510

Electronic Control

R-S Products Corporation, Electronic Div., Wayne Junction, Philadelphia 44, Pa., has issued catalog No. 27 titled **Leveltronic.**

This bulletin contains information on the new improved electronic circuit using a hot cathode thyratron control for liquid level and interface, pressure, and temperature.

The catalog is available on request and may be obtained by entering the above key number on a Reader Service Card.

The SEWER SCOOTER

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THE ONLY 100% SELF-PROPELLING SEWER CLEANER

THE FLUSHING ACTION IS APPLIED BY COLLAPSING THE SHIELD.

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Complete Geophone outfit consists of connecting tubes, two Geophone discs, headpiece, and heavy leather-covered carrying case with shoulder strap. **$85**

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Globe Phone Mfg. Corp. Reading, Mass., U. S. A. Dept. F

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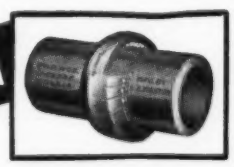

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- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
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Large stock enables us to make prompt shipments.

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SIZES 2 TO 84

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11 Broadway, New York

Warren Pipe Company of Mass., Inc.

511

Water Service Products

Hays Manufacturing Co., 12th & Liberty St., Erie, Pa., has prepared an excellent loose-leaf catalog with hard back binding to present their water service products, including curb stops, corporation stops, gooseneck fittings, service boxes, and drilling machines.

For the water distribution system of any water supply, this catalog contains complete information on these types of products.

If you desire a copy, please enter the above key number and your name on a Reader Service Card.

512

Water Level Control

A one-sheet bulletin issued by Healy-Ruff Co., 2255 University Ave., St. Paul 4, Minn., presents the **Condensed Roto-Trol Data Sheet.** This sheet gives the names and numbers of the several bulletins in which are described Roto-Trols for elevated tanks, standpipes, and reservoirs; Roto-Trols for hydro-pneumatic or pressure tanks; Roto-Trols for sewage pumps, programming control, sequence control, single pump control, pressure operated sump control, auto-

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PURIFICATION FOR WATER-SEWAGE & SWIMMING POOLS

Everson SterElators Operate Manually or Semi-Automatically, Also Automatically Proportion Gas Flow to Water Flow.

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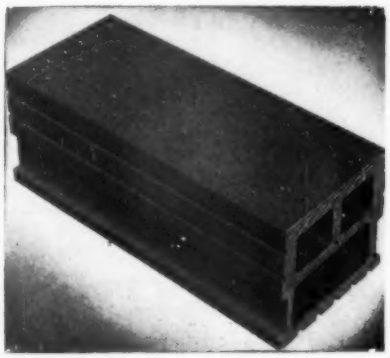

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Works: West Medford Station, Boston, Mass.

matic alternator, electric time delay, and remote controllers.

If you are interested in any of these items for controlling water and sewage works operation, you may obtain this folder by sending in a Reader Service Card with the above key number.

513

Vibratory Equipment

The Syntron Co. of Homer City, Penna., has announced the availability of a complete new 92 page catalog which describes its **Vibratory Materials Handling Equipment.** Included in the catalog are electromagnetic vibrators, packers, vibratory feeders, dry feeder machines, weighing feeders, vibrating grizzlies, etc. Also included are the company's **Construction and Maintenance Tools,** which include self-contained gasoline hammer paving breakers, portable electric hammers, drills, grinders, sanders, form vibrators, etc. A copy of this new catalog is available to anyone requesting it on a company letterhead.

514

Pressure Controllers

The Leslie Co., Lyndhurst, N.J., has issued Bulletin 462 on **Engineering, Operating and Maintenance Data on Pressure Controllers.**

This bulletin covers the subjects of selection of pressure controllers, control pilots, sizing and capacity tables, installation, operation, maintenance, and diagrams of pictures of the various diaphragm regulating valves for any and all types of use where pressure reduction is essential in plant operation.

If you desire a copy of Bulletin 462 on pressure controllers, enter the above key number on a Reader Service Card.

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BOND-O

A dependable self-caulking joint compound for cast iron bell and spigot water mains.

Used by hundreds of water companies—water departments and water works contractors.

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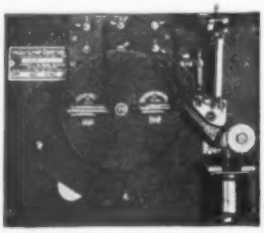
ROTO-TROL



TYPE "A"

Type "A" Roto-Trol operates from the pressure in the pump discharge line, at the pump house. The electric time delay prevents starting or stopping due to surges. It also protects deep well turbines from damage due to back-spin . . . *Type "A" Multi-Pump Roto-Trol* is designed for two or more pumps discharging into the same discharge pipe. Adjusted time delays compensate for additional pumping friction and surges when second pump starts or stops.

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Water Levels Control Division

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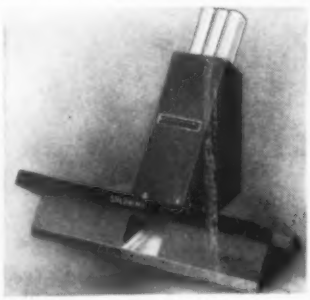

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Nine color standards, a complete set for any one determination, are permanently enclosed in a plastic slide eliminating the cost and difficulty of handling single standards. Accuracy is assured by the Taylor Liquid Color Standards which carry an unlimited guarantee against fading.

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W. A. TAYLOR AND CO.

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515

Water Meters

Pittsburgh Equitable Meter Division of Rockwell Manufacturing Co., 400 N. Lexington Ave., Pittsburgh 8, Pa., has a condensed catalog, Bull. W-800 Rev. 1 on **Pittsburgh-Empire Water Meters.** This four page folder shows ten different meters from Empire, including the Empire Oscillating Piston Meter in four sizes, Pittsburgh IMO Meter, the Pittsburgh Disk Meter, the Pittsburgh Current Meter and the Pittsburgh-Empire Compound Meter.

For copy of this catalog, enter the above key number on a Reader Service Card, and mail to Reader Service Dept. of this magazine.

516

Diaphragm and Plunger Pumps

The Domestic Engine & Pump Co. of Shippensburg, Pa., has issued Bulletin 44-T on its **Diaphragm and Plunger Pumps.**

The 12-page book shows photographs of various types of diaphragm pumps which the company makes, tells the various features about them, shows cutaway drawings, and gives specifications. The same information is presented for plunger pumps. One page is devoted to pictures of vertical centrifugal pumps, plunger sludge pumps, and sewage pumps.

If you desire a copy of this bulletin, enter your name and the above key number on a Reader Service Card.

517

Chemical Feeders

Liquid Conditioning Corp., 114 E. Price St., Linden, N. J., has published Bulletin 14 on the **Decantrol** and other chemical feeders.

This bulletin explains the purposes and application of the different control systems for feeding chemicals to water. One section of the bulletin is devoted to the Decantrol, the company's latest development in chemical feeders. Illustrations include drawings and photographs showing principles of design and operation of the different types of feeders.

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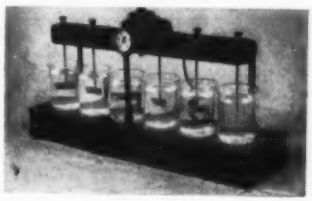

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518

Pumps

Marlow Pumps of Ridgewood, New Jersey, have a four page folder on Marlow **Self-Priming Centrifugal Diaphragm and Sludge Pumps.** This folder shows the plunger sludge pumps and the self-priming centrifugals, as well as the Marlow Mud Hog.

If you are interested in self priming centrifugals, diaphragm and sludge pumps, enter the above key number on a Reader Service Card.

519

pH Control

Milton Roy Co., 1300 E. Mermain Ave., Chestnut Hill, Philadelphia 18, Pa., has reprinted from **Industrial & Engineering Chemistry,** Vol. 39, No. 11, Nov. 1947, an article by Robert T. Sheen, Consulting Engineer of the company. The article, titled "Automatic pH Control in Water and Industrial Waste Treatment," is listed as Technical Paper No. 55. Pictures and diagrams illustrate the points made and several typical installations are described. Copies of this reprint are available. Use a Reader Service card to obtain one.

520

Wood Stave Pipe

The Santa Fe Tank and Tower Co., 5401 S. Boyle Ave., Los Angeles 11, Calif. have a catalog on **Wood Stave Pipe.** This catalog tells of the origin of wood pipe, and how wood pipe is designed to serve every industrial need. Other features of the catalog are sections on types of wood stave pipe, cast iron fittings for wood stave pipe, welded steel fittings, and hydraulic data. If you have a problem that wood stave pipe or tanks might solve, you will be interested in this catalog. Write for it.

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WITH

CARSON CLAMPS

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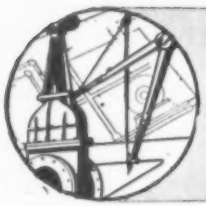

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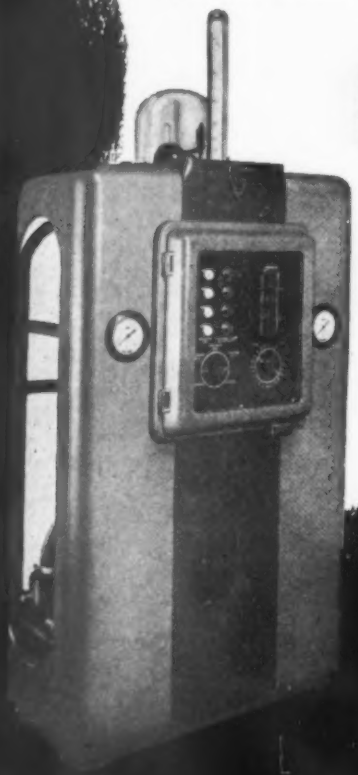

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